Marine Engineering
and Shipping Age

Volume XXXIII **January, 1928** **Number 1**

Published Monthly by
SIMMONS-BOARDMAN PUBLISHING COMPANY
30 Church Street, New York
H. H. Brown, Editor
L. S. Blodgett, Associate Editor

James Swan, Contributing Editor

Subscription price: United States, Canada and Mexico, $3.00; foreign countries, $4.00. Single copy, 35 cents.

Marine Engineering and Shipping Age is a member of the Associated Business Papers, Inc. (A. B. P.), and the Audit Bureau of Circulations (A. B. C.).

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult, and often impossible, to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address, please be sure to send us your old address as well as the new one.

Agreement at Last

POSSIBLY the principal reason for the lack of success which in the past has almost uniformly attended the attempts of American shipping and shipbuilding interests to obtain any material aid from the government has been the absolute want of unanimity in their own ranks. Even the shipbuilding and ship repairing companies, relatively small as their number is, have never seemed able to really get together; immediate and often entirely selfish motives have fogged the broad view which of necessity must always precede really worth while and constructive action. As between the ship owners and operators and the shipbuilders, the situation has been even worse—it has seemed next to impossible for the representatives of these two closely related industries to appear before the Congressional Committees with singleness of purpose and a united front. As a prominent member of the Congress remarked to the writer, some two years ago, "How can you fellows expect any intelligent action by our Committee when you evidently can't agree among yourselves and apparently don't know just what you *do* want."

The mutual misunderstandings which so far have pretty effectually blocked any real progress toward constructive shipping legislation may, very largely, be laid at the door of each of the interested parties. It seems a habit of shipowners to consider *any* price for a new vessel, as too high. Part of this idea is perfectly natural; all business men wish to buy at as low a price as possible, but there is one very pertinent matter bearing upon the question, which we fear the shipowners are prone to overlook—the steadily increasing cost of vessels, entirely apart from the abnormal effects and results of the war. The complication of both structure, fittings and machinery of commercial vessels has, during the past 25 years, increased materially, an increase clearly reflected by the greater variety and cost of the materials entering into the construction and the greater amount of labor required to carry it out. Shipowners are much given to comparing prices of new vessels with those of their older ships, quite forgetful of the fact that about the last thing they would be willing to accept would be an *exact* duplicate of any of the latter. Much that was formerly looked upon as of doubtful utility a few years back has now come to be a necessity and considered quite essential to successful and competitive operation and these new things cost money. On the other hand, the shipbuilders, particularly since the war, have consistently played lone hands, have persisted in quoting prices that often did not even cover actual material and labor and have otherwise merrily proceeded with the pleasant game of cutting each other's throats; incidentally establishing firmly in the minds of prospective purchasers an entirely erroneous idea of the actual cost of building ships.

Fortunately for our shipping interests the saying "it is a long road that knows no turning" is as true today as ever it was—additional proof of this fact is now furnished by the Wood shipping bill, expressing as it evidently does, the united opinions and desires of both shipowners and shipbuilders.

Later it is the intention of Marine Engineering and Shipping Age to discuss at length the details of this very important and very badly needed piece of proposed legislation—for the present it will suffice to say that Mr. Wood's bill represents the earnest and united efforts of the shipping industry, both builders and owners, to extend protection, in what appears an entirely practicable and reasonable manner, to the only entirely unprotected American industries, shipbuilding for and ship operating in foreign trade. Certain leaders in both have brought the two divisions of the industry together and have formulated the bill in question—it should, and one cannot doubt but that it will, receive the energetic support of everyone in any way concerned with American merchant shipping—and this interest, it seems to us, should reach to every citizen of the country.

A general outline of the provisions of the Wood bill appear elsewhere in this issue. The complete bill as presented to the House of Representatives will appear in our February issue.

Generated on 2024-09-12 14:42 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The President's Message

MR. COOLIDGE'S latest message to the Congress differs from its immediate predecessor in that it contains *some* encouragement for American shipbuilders. His handling of the cruiser situation, viewed from a purely political standpoint, has been masterly. His last message, delivered before the Geneva Naval Conference had assembled, called for an authorization of paper ships—steel absolutely not wanted—and won the gratified approval of the pacifists. Now the conference has failed and the President is able to remind the Congress that if they had only listened to him, in the first place, they would already have 10 instead of 4 new cruisers authorized for construction. As a piece of political strategy or of statesmanship—the particular definition depends on one's point of view—it was hard to beat. However that may be, it now seems evident that the President really wants some more cruisers; he will very probably get them, so, first and last, everyone has been, or should now be, satisfied.

It goes without saying that a program of naval shipbuilding will, under present conditions, be in the nature of a life saver to the private shipbuilders, assuming that the new work will be put out to contract and not placed in the navy yards. So far as one is able to appraise the general sentiment of the Navy, it is against navy yard shipbuilding on a large scale; the support of that policy comes, in the main, from local politicians. It is difficult to understand just why the votes of navy yard employees should be given greater consideration than others, for there are certainly many more workers in the private shipyards and repair plants than in the government yards. The new work should be placed in the private shipyards not only because the continuance of these yards as efficient organizations is vital to the welfare of the country but also because the work will be done for less money in the private yards than in the navy yards.

As regards the merchant marine, the message seems to us entirely negative. There is some rather pointed criticism of the Shipping Board which, undoubtedly in certain quarters, will be looked upon with approval. We are all, in theory at least, assumed to be in favor of private ownership; but as to how that is to be brought about, the message is as bare of suggestion as was its predecessor. It is implied that the present vessels should be kept in repair, so that when turned over to private owners they will form a naval reserve—a suggestion which cannot be taken seriously, so one is forced to wonder just what it means, if anything. The present vessels are entirely unsuitable to form an efficient fleet of naval auxiliaries, and it would seem that the President must be fully aware of this fact, if he takes an interest in the merchant marine in any way approaching that which he has obviously taken in other matters of national importance. One is forced to the conclusion, some time ago mentioned in these columns, that Mr. Coolidge looks upon shipping as an unwelcome responsibility which, much against his will, he is forced to recognize.

The writer has the greatest admiration for the manner in which Mr. Coolidge has managed the executive branch of our Government—a feeling which is evidently shared by a large proportion of the thinking citizens of this country. One cannot but feel that the President's apparent lack of appreciation of the very serious situation in which the shipyards now find themselves, and of the vital need of prompt action if this essential industry is to be saved from practical extinction, is due to misinformation. That bills to aid private shipping and shipbuildng will be introduced in the present session of the Congress, there is little doubt. Surely there must be some way in which the urgency of the situation can be made plain to the Executive; intelligent, clear minded and fair as he has so well proved himself to be in other matters of national concern.

The Steamboat Inspection Service

WE have but one criticism to make of the annual report of the Supervising Inspector General of the Steamboat Service—it is too brief.

The thoroughly efficient and sensible manner in which Mr. Hoover has taken up and is carrying on the very great task which has been given him has elicited the highest commendation on every hand. The very brevity and conciseness of his report bespeaks the modest efficiency with which he is carrying on his work, but it is a most far-reaching and important work and we could wish to hear more of the details from its director.

The Steamboat Inspection Service has been the object of much criticism, often merited, but largely brought about by practices and conditions which have been inherited and for which its present organization cannot justly be held accountable. That it is attempting to meet present demands and requirements with the organization and methods of a bygone era is largely the result of circumstance. One has not far to seek in order to find similar situations in other governmental regulatory bodies. In a few words, the report makes the matter clear and strikes at the root of the trouble with the Inspection Service, so far as trouble exists.

"The Supervising Inspector General is," says the report "under the law directed to obtain uniformity, but the machinery with which he works has, in many instances, to function before he can know whether there is any lack of uniformity. The right time to obtain uniformity is before the action is taken.

"The Service has often stressed its dependency upon 'practical' men, and its regulations require that only men who have been officers on ships can hold positions as inspectors. This has obtained good results thus far, but it is desirable to obtain even better results in the future. To do this, it is my desire, while availing myself of all that the practical men know, to create and develop a technical staff. The day of rule-of-thumb methods is past and the day of the technician is at hand. It is not sufficient for the Board of Supervising Inspectors to legislate as necessity arises, but it should have at its command the machinery with which to plan in advance. That can be done only by a central staff of technical men, the result of whose investigation from the technical side would be available to the Board of Supervising Inspectors working from the practical and legislative side."

Here is the whole trouble in a nutshell—lack of uniformity in methods and requirements and opportunist legislation. The above quoted statement not only makes clear the difficulty, but goes a long way on the road to its cure. In

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

addition, Mr. Hoover would have a "Marine Inspection Service," rather than a "Steamboat Inspection Service"—an entirely proper and logical first step in his program of modernization.

After stressing the impossibility of obtaining uniformity in a boiler inspection carried on, largely independently, by 46 different boards of local inspectors, a strong plea is made for the modernization of inspectors' salaries—a most necessary part of the program. The kind and character of men which the service *must* have to carry on the vitally responsible work with which it is charged cannot now be obtained or held on a pre-war wage scale!

The wisdom of governmental control and regulation of ships' stability has often been questioned. The possibility of such control by the British Board of Trade has, we understand, aroused active opposition among our shipowning cousins on the other side of the Atlantic; but all this is beside the point, so far as this country is concerned, for we have governmental control as an established fact. We should have been glad if the Inspector General's report had contained more extended and detailed comment upon this very important part of his work.

The regulation of stability by rule is a tremendous undertaking—its practical possibility has yet to be proved—but with the Inspection Service specifically required by law to regulate this illusive property of ships, it is at least reasonable to demand that the problem be approached logically and treated with some degree of uniformity; else a condition akin to the present requirements of boiler inspection, but far more serious, may easily be brought about. To use a homely expression: while it may not be possible to put a ship, by any rule, into the right pew, it should at least be seen to that she gets into the right church, when her stability is called into question.

The report suggests that with an increased hull technical staff, the question of bulkheads and subdivision, in addition to stability, might well be taken up. The two subjects are interdependent and can be handled intelligently only when taken together. If, in addition, load line legislation finally becomes a fact in this country, as seems very probable, the hull technical division of the Inspection Service, which Mr. Hoover visualizes, will undoubtedly become a large and most important organization.

In connection with that very important portion of the board's responsibilities—fire protection—the familiar subject of the fireproof excursion steamer is brought up. Undoubtedly the problem of fire prevention will be greatly simplified with the coming of the fireproof steamer. With the possible exception of a very few and very special cases, she has not yet arrived, but it is fairly safe to say that she is "on her way." Mr. Hoover's suggestion is timely and sound; probably he considers it somewhat outside of his bailiwick to advise just how the fireproof craft may be constructed—if he can do so, he will most surely lift a load from the shoulders of more than one ship operator. It is one of the outstanding problems constantly before the designer and operator, particularly of bay and river vessels, but far too extensive to be considered in detail here.

Next in importance to the prevention of fire comes its prompt and certain detection. It is most satisfactory to know that the board is leaving no stone unturned in its endeavors to formulate practical and effective rules covering this important part of a ship's equipment.

The report is concluded with a statement of the present ridiculous situation as regards the licensing of motor boats and their operators. What is needed here can hardly be called modernization—rather the application of a few grains of common sense.

Altogether, the report clearly indicates that the Supervising Inspector General fully realizes the weak spots in his organization and in its methods, and is arduously striving to bring about their correction. "More power to him."

Engine Foundations

THE advent of the marine internal combustion engine has brought back into the front rank of importance the design of engine seatings and foundations; brought it back in a manner which strongly reminds one of the declining days of the fast running reciprocating steam engine—just previous to the practically complete occupancy of the high speed field by the steam turbine.

In much the same manner as the iron ship was developed from its wooden predecessor did the steamer grow out of the sailing ship. The iron vessel, in the manner of its framing and structural arrangements, showed every clearly the influence of wooden shipbuilding practice while the steamship was evolved from the sailing ship mainly by additions to rather than by modifications of the hull structure of the latter. Thus engine foundations were looked upon as structures built upon and not as integral parts of the hull. This view was by way of being modified in the latter days of high speed reciprocating engine vessels—fast cruisers and torpedo boats—while in the design of large passenger liners it seems to have been pretty well recognized that engine foundations must be treated as a part, and a most important part, of the general hull structure.

Since the coming of the Diesel engine signs are not wanting that in many instances the lessons learned, or which should have been learned, from the high speed steam engine have been forgotten or neglected. Undoubtedly the Diesel with its enormous range of cylinder pressures, varying torque and, particularly for the single acting type, large number of cylinders and great length is inherently more productive of hull vibration than a steam engine of the same power but at least in some instances which have come under the writer's observation, where serious and very annoying vibration has been experienced, he cannot but feel that a more thorough consideration of the design of the engine foundation and attention to structural details would have gone a long way toward the elimination of the troubles which were experienced.

As Professor Lewis stated in his recent paper before the Society of Naval Architects and Marine Engineers, it is possible, by certain modifications in their design, to very largely decrease the internal vibrations and stray forces set

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

up by many of the present types of Diesel engines but one cannot but feel confident that, regardless of the type of engine, a thoroughly well designed, stiff and strong engine seating, incorporated with rather than built onto the hull structure goes a long way towards a solution of the vibration problem in all cases, and in some may nearly, if not entirely, eliminate it.

A study of the engine seatings of all of the early steam vessels and, in fact, of many of the more recent ones, seems to demonstrate rather clearly the fact that they were looked upon merely as weight distributors and nothing else. To a large extent their design was given over to the engineer, rather than the shipbuilder, and the latter, beyond making certain increases in scantlings called for by the classification societies, paid little or no attention, leaving the filling in of the gap between engine and hull to his engineer co-partner. The effect of this division of structural design work is to be found in a large proportion of the sea-going vessels at present afloat. Fortunately the greater number of them have slow running engines of relatively small power and the hull vibrations caused by the latter's operation are generally of little moment.

In effect what happened in the design of these ships is as follows: The hull draftsman got out the scantlings of his double bottom, including its depth, in strict conformity with the classification requirements, the resulting bottom construction being, with the exception of certain scantling increases of relatively small importance, the same under the engines as elsewhere. From that point on the engineer takes over the matter. The shaft line, particularly with a single screw vessel and slow running engine, is well above the tank top. A foundation structure is built up upon the latter, having usually at its top a very heavy plate upon which the engine rests. This foundation is pretty well limited to the length of the engine, being "tapered off" longitudinally and athwartships by brackets over the hull intercostals and floors. The result, taken as a whole, is a stiff structure but one in which by far the strongest member, aside from the bottom shell plating, is at or near the neutral axis of the girder—practically useless in resisting deflection, either longitudinal or transverse, and having little or no effect as a dampener of engine vibration. Furthermore the relatively small length and breadth of the foundation can offer but little resistance to rocking vibration of the engine either fore and aft or athwartships. Of course there are certain well founded objections to placing an engine directly on the tank top plating, but it would seem that they are far outweighed by the structural advantage resulting from a deep double bottom which is gradually brought down to normal depth forward and aft of the machinery; in other words making the engine foundation an integral part of the hull structure.

In single bottom vessels much the same result may be arrived at by fitting deep floors and intercostals brought up as close to the shaft line as the engine bed plates will allow, with a heavy foundation plate covering a large portion of the whole machinery space. The writer has in mind a steel Diesel-driven yacht in which, in spite of much and vigorous criticism and opposition, deep floors extending straight across the hull from side to side and coming right up to the engine beds were fitted on *every* frame and a continuous center keel, and, on each side, several intercostal keelsons of the same depth, extended from bulkhead to bulkhead of the machinery space, from there to be gradually tapered to the normal and very light framing of the hull. It was a heavy foundation and, when set up, looked out of all proportion to the remainder of the framing but the result was what proved to be perhaps the most satisfactory Diesel yacht, so far as vibration was concerned, which has so far been built in this country.

The writer is quite well aware that the ideas here set forth are entirely elementary and fully recognized by every competent naval architect. Nevertheless it is fairly certain that a large part of the troublesome vibration which has been experienced with motor-driven vessels has come from a too casual consideration of these same elementary principles and, it is to be feared in some cases, from entire neglect of them.

The Agamemnon and Mount Vernon

UNTIL the government provides for the construction of new passenger ships for the United States Lines, the North Atlantic service operated by the Shipping Board will find it difficult to maintain its prestige in competition with the progressive foreign lines which are planning to build new liners for this service. While the prospects for building new American vessels for this service are by no means promising, there remain in the idle fleet of the Shipping Board two former transatlantic liners which offer attractive possibilities for reconditioning for further useful service in conjunction with the present fleet. These are the *Agamemnon* and *Mount Vernon*, and as was pointed out in these columns less than a year ago, plans have been prepared for converting these vessels into fine 20-knot ships, each having 4,000 tons more deadweight carrying capacity and 25 percent more passenger accommodations than formerly. Recent surveys show the hulls to be in excellent condition and with modern machinery and new passenger quarters they would provide a very useful addition to the United States fleet. The money for this work is available in the Shipping Board building and loan fund and it only remains for the Congress to approve its expenditure for this purpose. This action should be taken without delay.

Notice to Subscribers

THE annual index of MARINE ENGINEERING AND SHIPPING AGE for the year 1927 will be published separately from the magazine before the end of this month. As the complete index will be useful only to those who have kept a complete file of the magazine for the year, only a sufficient number of copies will be printed to meet the requirements of readers who notify us of their desire for a copy.

A copy of the annual index will be mailed without cost to each subscriber whose request for it is received at our New York office on or before February 1, 1928.

Generated on 2024-09-12 14:16 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Recent Trend of U. S. Capital Ship Design

Modernization of six battleships, includes addition of hull blisters, tripod masts, deck armor and fuel oil burners—Main battery gun elevation increased

By Lieutenant Commander G. C. Manning, U. S. N.

UNDER the provisions of the Reduction of Armaments Treaty practically all capital ship tonnage then under construction in the United States embodying the latest design developments were scrapped. Further the treaty provided that the construction of new capital ships may not be started until November, 1931. The treaty permits the construction of "light" cruisers of not exceeding 10,000 tons (standard) displacement armed with guns not larger than 8-inch caliber. The efforts of the design personnel were therefore directed toward bringing out the most effective fighting ship on 10,000 tons standards displacement. If an aside may be permitted, those who have been used to thinking of men-of-war in terms of displacement in normal condition must revise their ideas somewhat. Ten thousand tons standard displacement is about 11,500 normal displacement. "Light" cruisers of this size have approximately the same displacement as our first battleships, the *Texas, Oregon, Indiana* and *Massachusetts* built 30 years ago.

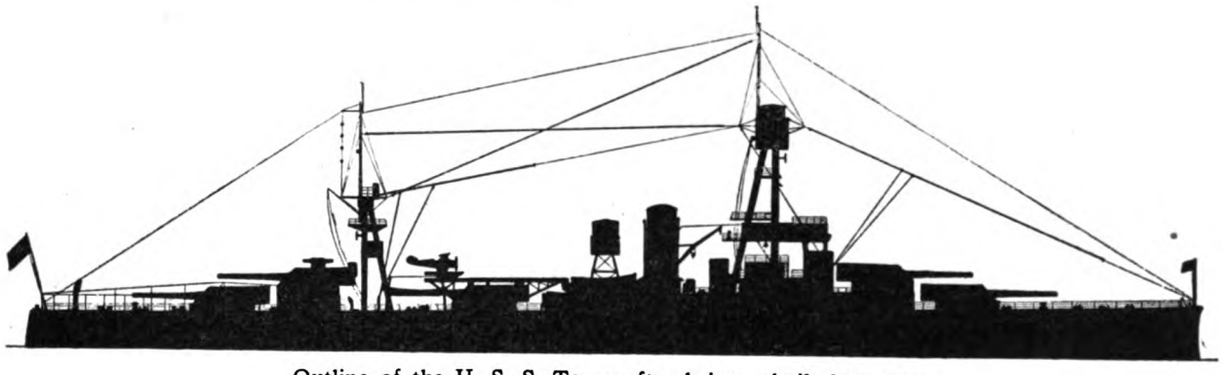
But while vigorous study of capital ship design lapsed and major developments ceased, constructive effort on this most important phase of naval design was only laid aside temporarily to be taken up when a satisfactory solution of the cruiser problem was obtained. These developments have come so slowly that when we look back a number of years we are amazed at the number of developments that have occurred. The only changes of a major nature for which funds have been available are the modernization of the six coal-burning battleships retained under the treaty. A study of the work done on these ships discloses that extensive design developments have taken place since the United States stopped new capital ship construction. Influences affecting the design changes disclosed in the modernization of our older battleships are:

(1) The improved efficacy of attack by submarines and aircraft.
(2) Desirability of uniformity in fuel.
(3) Probable use of heavy fuel oils.
(4) Use of higher steam pressures and temperatures.
(5) Proven efficiency of marine geared turbines.

For convenience of consideration the design developments discussed are arranged under the weight groups used in warship design.

The most pronounced change in the structure of these old battleships has been the addition of blisters. Longitudinally these blisters extend from the former forward torpedo rooms to near the stern and vertically from the top of the main armor belt (called the lower casemate armor in the older battleships having the main armor in two belts) to well under the bottom of the ship. In the six former coal-burning battleships the half-breadth of the blister was obtained from the consideration that the extreme beam after major alterations should be 106 feet. This figure was set because it gave a clearance of only 2 feet on a side when entering the locks of the Panama Canal. This clearance has been reduced in later modernization plans to 1 foot.

The contour of the blister was determined after trials in the model basin in which consideration was given to lines of flow and the curve of intersection of the blister and old hull so determined that no appreciable increase in the residuary resistance would result. Another important consideration affecting the contour of the blister was the transverse metacentric height and its effect on the period of roll. Recent tendency in United States capital ships has been to give them greater initial stability. The ability of the German capital ships having large metacentric heights to stand severer punishment than contemporaneous British ships of less G. M. as shown by the battle of Jutland, is largely responsible for this development. But some of the contours first proposed gave values of G. M. which were regarded as excessive because they would produce rapid and jerky rolling, and make the ships very wet in foul weather.



Outline of the U. S. S. Texas after being rebuilt last year

The subdivision and structural details of the blisters, except their attachment to the side armor, are similar to those of the "inside blisters" of the later battleships. In the case of two of these older battleships, the half breadth of the blisters was so great that a longitudinal bulkhead was worked for about half its length. This was not required in any other ships. The termination of the blister at the top, bottom and ends presented major structural problems in working out details. Only watertight transverse bulkheads were fastened to the armor, the non-watertights being secured only above and below the main armor belt. The location of the blister compartments outside the original

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

hull of the ship made it impossible to give access to them without cutting the original shell plating below water. Since the theory of underwater protection which has led to the blister type of construction requires intact longitudinal bulkheads, access to blister compartments is obtained through manholes in the blister shell and certain transverse watertight bulkheads. Sea valves operated from inside the ship are provided for flooding, but no provision was made for sounding or draining these compartments.

Due to the increased beam of these ships and the failure of the dry dock blocking under the *South Carolina*, an additional docking keel was fitted on each side outboard of existing docking keels extending about one-third the length of the ship. An interesting and probably unforeseen result of addition of blister in the case of the *Florida* was an actual reduction of residuary resistance. This followed as a result of a reduction of the longitudinal (prismatic or cylindrical) coefficient, the area of the midship section having received a greater increment than the displacement. On her trials with the displacement approximately 3,000 tons greater than before modernization, the ship made a fifth of a knot more speed than on her original trials with only about 3,000 more horsepower. This indicates that for the same displacement, the ship would have made her original speed on less power than before the addition of blisters. Since the addition of the blister increased the area of her wetted surface and therefore the frictional resistance, it follows that the residuary resistance must have been actually reduced.

Within the original shell of these battleships the subdivision and access have been changed to bring them up to the standard of post-Jutland design. A recent design development is the adoption of three skins in the boiler spaces. It seems logical that a third skin should be fitted under the machinery spaces. This was not done in modernizing the old battleships probably because of the expense involved in changing the run of existing shafting, relocation of propellers, etc. It is now a settled feature of design to provide no openings in longitudinal bulkheads and main transverse bulkheads below the deck next above the designer's waterline (third deck). Further flush armor hatches on the second deck located near the ends of the ship are protected by 12 to 18-inch coamings.

HULL FITTINGS

The most striking development as far as appearance is concerned is the abandonment of the cage mast and the adoption of the tripod mast in its place. This change, after adhering to the cage mast for 25 years, is noteworthy. It is further to be noted that the mainmast on modernized ships is shorter than the foremast and does not serve as a fire control or spotting position. The fire control station is in an independent structure located about the mid-length and at a moderate height above the upper deck. Structures above the weather deck in which personnel of ship control or fire control parties will have their stations in battle have provision for being closed gas-tight to protect such personnel against poison gas attack without the encumbrance of gas masks. Smoke stacks are reduced to one. Boat cranes, which have always been characteristic of United States warships, are retained and their outreach has been increased to permit the handling of airplanes. For launching airplanes gun-fired catapults have been installed on a high turret near the mid-length of the ship. Stowage arrangements for airplanes are provided on the upper deck.

With a view to reducing the vulnerability of capital ships to underwater attack, the boiler rooms are reduced in size and only one boiler installed in each boiler room. This makes it possible to do away with high capacity pumps for drainage purposes except in the machinery spaces where the main circulating pumps are available. The piping of the drainage system is simplified and reduced in size. The latest design development in connection with the arrangement of firerooms is to locate all fireroom auxiliaries in compartments inboard of the firerooms so that a boiler room may be flooded but the auxiliaries are not put out of commission. The chances of the ship's continuing in line after damage is thereby increased.

As a result of the disastrous turret explosion on the *Mississippi* the sprinkling and gas ejecting systems have been enlarged and changed in fundamental details. The turret sprinkling system is connected with the gas ejecting system which maintains an air pressure on tanks containing the supply of sprinkling water. Quick opening valves are provided in the system. These are operated by cocks in numerous locations so that flame in any location can be drenched instantly. Where the sprinkling tanks are empty a further water supply is obtained from the fire main. A line carrying air at a pressure of 2,500 pounds supplied by the torpedo air compressors is run below the third deck to banks of air flasks in locations to serve a certain part of the battery. These flasks may discharge through reducing valves to the gas ejecting main in event of the failure of an adequate supply of gas ejecting air due to any cause.

Certain vital spaces located below decks which do not contain any sources of heat are provided with a closed system of ventilation. Provision is made for cooling and purifying the air and recirculating it. This makes such spaces invulnerable to poison gas attack, and leaves the personnel therein free from the hampering effect of gas masks.

The fuel oil system has been greatly elaborated to make possible the use of very heavy fuel oil. A recirculating system is installed, the purpose of which is to discharge heated oil from the "service" tank to mix with the cold oil in a storage tank. The "service" tanks, that is the tanks from which oil is taken to be burned under the boilers, contain steam heating coils. The "storage" tanks have a ring of pipe around the suction which is perforated with small holes. If it is desired to use oil from a storage tank to replenish a service tank, and the oil in the storage tank is too thick to flow to the suction, heated oil from a service tank is pumped to the storage tanks, and sprayed in around the suction thinning the oil in that location. The oil drawn from the storage tank is pumped to the service tank heated and pumped back to the storage tank. This cycle is repeated until the oil in the storage tank is sufficiently fluid to be pumped out. Interlocking gear is provided so that hot oil cannot be discharged into a storage tank unless the suction is open. This device prevents putting an excessive pressure on the storage tanks. Pneumercators have replaced sounding tubes as the principal means of determining the amount of oil in tanks.

PROTECTION

As a result of the increased efficacy of aircraft attack and increased range of effective gun fire, deck armor has been thickened and two armored decks are now considered necessary. Further, the openings in armored decks have been reduced in number and size. The protective deck armor is now about 5 inches thick and splinter deck 3 inches. Further additional deck armor has been added at ends for protection of the steering gear and forward magazines as well as to reduce the probability of excessive change of trim by injury to ends. The thickness of armor on top of turrets and conning towers has been increased to about the same thickness as that of the protective deck. Armor gratings are provided in all openings of any size at the level of the second and third decks.

The recent tendency has been to provide fewer boilers of greater horsepower per unit. This was carried to the extreme in the cases of certain of the modernized battle-

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ships which have only four boilers of 10,000 horsepower each. The Navy has definitely abandoned coal and gone to oil entirely as fuel for capital ships. Steam pressure has been standardized at about 300 pounds, but superheat is now used, although for a long time its use was opposed by operating engineers. The insulation of the boilers has been increased materially, and diatomaceous earth blocks are used between the fire brick and boiler shell. The material and size and shape of boiler brick bolts have changed due to higher operating temperatures of boilers. Steam operated soot blowers and periscopic smoke indicators are installed. Blower burners have been discontinued largely due to the excessive fireroom temperatures with that type and the difficulty of adequately supporting the installation on the boiler fronts. The closed fireroom system of forced draft has come back as the standard system and fireroom pressures have been increased up to about 8 inches of water. To prevent the spread of fire due to oil dripping in the fireroom, the dry bilge has been adopted. All auxiliary machinery handling liquids, steam, water or oil is provided with drip pans from which a drain is led to the bilge sump tank. A bilge sump tank is provided in each fireroom into which is discharged the sludge from a mechanical separator of the rotary type. A gravity type separator is provided to handle the condensate from the fuel oil heater. In conjunction with this separator there is a vapor condenser to handle the vapor from the very hot condensate from the fuel oil heater. The condensate from this vapor condenser discharges to the separator.

The tendency is distinctly towards rotary pumps for all purposes, circulating, feed and fuel. And, in general, the earlier use of electric motors for driving rotating auxiliaries has been discontinued in favor of turbine drive for such. Geared turbines have been accepted as entirely satisfactory for propulsion units. To reduce the discomfort in the engine room, condensers are provided to condense the vapor from the gland steam seals. With the higher temperatures of the main steam steel valves and fittings are required. Parts exposed to corrosion such as seats, poppets and stems of valves are of monel metal.

ORDNANCE

The angle of elevation for the main battery guns of the future will undoubtedly be considerably greater than it has been in the past, certainly not less than 30 degrees. The secondary battery will be mounted not lower than the main deck, and probably one or two deck heights higher, if practicable to insure being able to use this battery except in very foul weather. The 5-inch A.A. gun is now standard, and new ships will probably have not less than eight such. Below water torpedo tubes will probably not be installed on new capital ships. Such ships will in all probability carry no torpedoes at all.

OUTFIT

The steam launch has at last been tossed into the discard. The tendency is always to provide more and bigger boats. There are very few boats provided which are not self-propelled. Pulling and sailing boats have gone out of style. Even the lifeboats are motor driven.

Battleships all carry airplanes now and stowage and handling arrangements must be provided for them.

Wood has been practically eliminated for all purposes, furniture, joiner doors and similar equipment is now being made exclusively of metal. The hammock, the bag and ditty box will soon be but a memory on capital ships. The crew will sleep in bunks and keep their clothing and other belongings in metal lockers.

FUEL

With the change in kind of fuel has come a tremendous increase in the amount which can be carried. Storage facilities are now provided so that capital ships can carry nearly twice as much fuel as they used to, thereby increasing their cruising radius materially. The change of power boats from steam to gasoline, the increase in number of boats and addition of airplanes makes necessary the carrying of gasoline in rather large quantities. This has resulted in the design of a hydraulic system of stowage for adequate safety in storage and rapid operation for fueling boats and airplanes.

SUMMARY

The major design developments in capital ships which have taken place during the past ten years have been lightly touched upon. Because of the secret and confidential nature of much of this work it is not permissible to give details, but a general summary of such developments has been given to indicate to shipbuilders and designers, and others interested in such matters the general trend which has been taken by such development, and particularly to call to their attention that development has been progressive even though no new ships have been built, and that the next capital ships which the United States does build will very probably differ in many essential particulars from what are now our newest ships.

Self-Docking a Floating Dry Dock at Charleston, S. C.

A FLOATING dry dock should be examined periodically inside and out. To do this, it must be placed in a larger dry dock or there must be means for self-docking so that the entire exterior may be completely removed from the water. The results of such dry docking and examination of floating docks is usually of interest, particularly any reports bearing on the condition of the exterior.

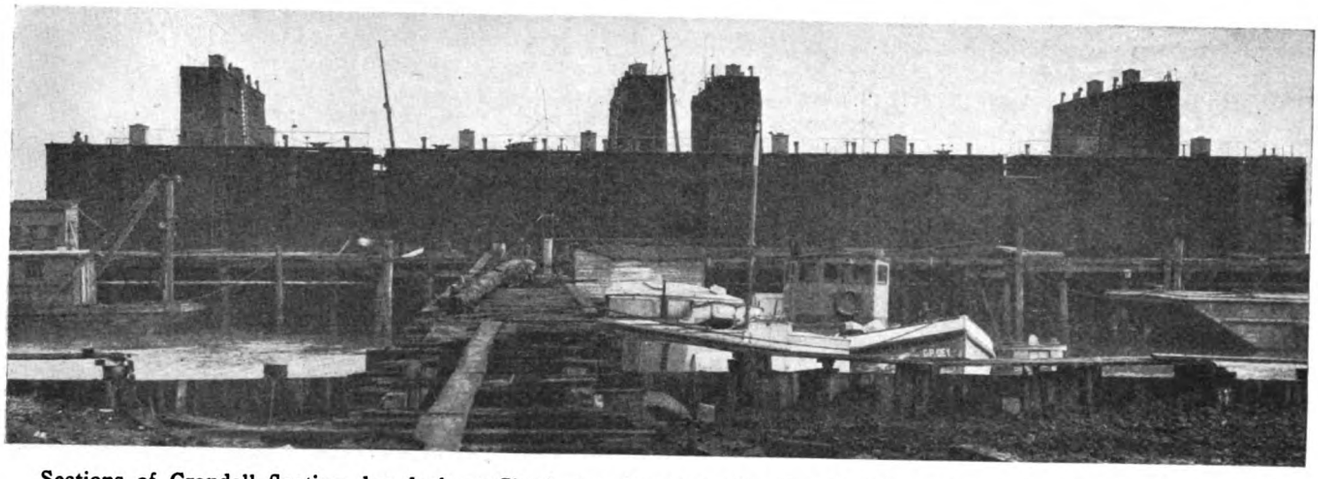
In 1918, the Charleston Dry Dock & Machine Company, Charleston, S. C., put in operation an 8,000-ton floating dry dock of the longitudinally trussed sectional type designed by The Crandall Engineering Company of Boston, Mass. This floating dock was of all-wood construction built with six sections. In the longitudinally trussed type, the panel of a Warren truss is built into both wing walls of each section. At the panel points are steel castings with corresponding lugs which when pinned together form the dock into a rigid unit with a Warren truss in each wing. The lugs of these steel castings are connected in each case by a single pin, there being four pin connections between each section. For docking, it is only necessary to remove these four pins, turn a section through 90 degrees and dry dock it on the others as illustrated.

The submerged portion of the dock was sheathed with a layer of ship's felt and 1 inch creosoted boards and then another layer of ship's felt and another layer of creosoted boards to protect this portion of the dock from the marine borers which are unusually active in Charleston harbor.

In the latter part of 1926, after having been in service eight years, the sections were disconnected in sequence and lifted on the others as above described until all had been removed from the water examined and repaired. This whole dry docking operation was easily accomplished.

C. V. Boykin, general manager of the Charleston Dry Dock & Machine Company, reports that examination showed the dock structure to be in perfect condition. In some places the outer sheathing of creosoted boards was eaten away but the inner sheathing was still intact and there was not a worm in any part of the dock itself. Examination of the inside of the dock showed that considerable mud had accumulated but that all parts of the trusses

Generated on 2024-09-12 14:18 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Sections of Crandall floating dry dock at Charleston disconnected and docked in the remaining sections of the dock

and framing were in first class condition. The outer sheathing was renewed where required and any corroded fittings replaced after which the dock was again put in commission. This floating dock is the largest on the Atlantic coast south of Newport News and has been almost constantly in use since it was built.

Motorship Building in France

SEVERAL interesting devlopments have taken place in the shipbuilding industry in France during recent months. The French Line has invited tenders for the construction of one, two or three 11,000-ton deadweight motor cargo vessels for the Pacific lines, and also for one medium-sized motor passenger liner to be run in Mediterranean waters. The orders have not yet been placed, but it is learned that the French Line is also contemplating ordering a motor liner to be run on the Central America service.

Navy Orders Motor Tankers

That the largest French shipping company is considering the building of Diesel-engined vessels will no doubt influence the policy of other companies in new ship construction, especially as the French Navy has just made a most important decision in this respect by ordering two new 8,600-ton deadweight motor tankers. These new ships will be 140 meters long over all, 18.85 meters beam and 10.40 meters depth, with a displacement of about 15,000 tons, and a draft of 8.04 meters. They are to be built on the Isherwood-Millar system and will have two longitudinal bulkheads in way of the oil tanks in order to improve their stability. The propelling machinery of each of these new tankers will consist of two Burmeister and Wain four cycle single acting 6-cylinder engines (740 millimeters bore by 1,300 millimeters stroke), capable of developing a total of 6,600 indicated horsepower at 125 revolutions per minute, the service speed being as high as 13.5 knots. There will also be three Burmeister and Wain auxiliary sets supplying electric current.

The orders for these tankers have been placed as follows: the Chantier et Ateliers de Saint-Nazaire-Penhoet, who are licensees for Messrs. Burmeister and Wain, will build both the hull and the engines of one of the ships, while the hull of the other will be built at the Bordeaux yards of the Ateliers et Chantiers Maritimes du Sud-Ouest, the engines for this ship being supplied by Messrs. Schneider et Cie, licensees for Messrs. Burmeister and Wain.

The Ateliers et Chantiers de la Seine Maritime have just delivered to the French Navy the motor tanker *Le Loing*, of 6,465 tons deadweight, equipped with two Burmeister and Wain engines, developing 4,100 horsepower, constructed at the Penhoet works. This ship ran very satisfactory trials, a speed of 13.96 knots being attained, while the contract speed was 13.5 knots. Thanks to orders placed by the French Navy and by foreign shipowners, Diesel construction in France is making steady progress, as is further evinced by the successful results of the shop-trials of the Burmeister and Wain 4,250 indicated horsepower engine constructed by Messrs. Schneider et Cie at their Le Creusot works for the Norwegian tanker *Orkanger*, of 10,500 tons deadweight, the hull of which is building at the Le Trait yards of the Ateliers et Chantiers de la Seine Maritime.

Motorships for Foreign Owners

While only 3 motorships are at present on the stocks to the account of French companies, there are 9 motor vessels building or completing in French yards for foreign owners. One of these, the cargo vessel *Toronto*, built to the account of Messrs. Wilh. Wilhemsen, Bergen, was launched on August 17 from the Grand-Quevilly yards of the Chantier et Ateliers de St. Nazaire-Penhoet. The same firm delivered some weeks ago to another Norwegian owner, Mr. Fred Olsen, a very interesting motor cargo vessel of 11,000 tons deadweight, the *Benjamin Franklin*, the Burmeister and Wain engines being constructed at the Penhoet works, like those for the *Toronto* and for another Norwegian motor cargo vessel, the *Témméraire*, completing at the Penhoet yards.

One of the five French merchant motorships now on service, the cargo vessel *Camranh*, of the Chargeurs Reunis (which was the first French ocean-going motor vessel) is being converted into a passenger liner at the Penhoet yard. She is to be renamed *Brazza* and to be placed in service on the Western-Africa line in November.

As stated above, French shipbuilders, like Diesel engine builders, are living on naval and foreign orders, as there is a persistent lack of orders from the French companies. This appears from the fact that at the time of writing there are only 12 important merchant vessels on the stocks in France, and 6 nearing completion. Of these 18 ships, there are 12 foreign vessels and 6 French ships only. These 18 vessels include 12 motorships and 6 steamers, and it is further noteworthy that there are no fewer than 11 tankers in this total.

As regards repair facilities in France, considerable interest attaches to the delivery to the Bordeaux Self-Managing Port of a 25,000-ton floating dock constructed in Germany under the Dawes Plan, which is the largest floating dock in France.

Generated on 2024-09-12 14:16 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Opening of Congress Marks Renewal of Fight for Merchant Marine Legislation

President's message discusses problem in general terms— Six bills presented in Senate and House of Representatives— Wood bill receives backing of ship operators and shipbuilders

By Harold F. Lane

THE annual struggle for legislation to place the American merchant marine on a more permanent and stable footing has begun in Congress with the introduction of numerous bills for that purpose, but at the present writing definite plans for their consideration have not yet been announced and the extent to which they are likely to be a factor in the deliberations of Congress is somewhat uncertain. Hearings on several of the bills were held during the last session of Congress but were concluded so late in the session that no action was taken.

No specific legislative proposals relating to the marine question were included in the President's message to Congress, which advocated rather a transfer of the ships now owned by the government to private ownership as rapidly as possible, although the President said that "more attention should be given to merchant ships as an auxiliary of the Navy," and that the possibility of including their masters and crews in the Naval Reserve, with some reasonable compensation, should be "thoroughly explored" as a method of encouraging private operation of shipping.

The government fleet, he said, is transporting a large amount of freight and is reducing its drain upon the Treasury, but "public operation is not a success" and "it should be our policy to keep our present vessels in repair and dispose of them as rapidly as possible, rather than undertake any new construction. Their operation is a burden on the National Treasury, for which we are not receiving sufficient benefits."

Further comment along the same lines was included by the President in an address to the Republican National Committee in which he said: "It would be much cheaper and far more beneficial to get it (our merchant marine) into private hands under some system of government support which would enable it to meet the lower costs of building and lower rates of wages of foreign shipping."

Merchant Marine Bills

Senator Jones, of Washington, chairman of the Senate Commerce Committee, announced on December 17 that the committee had discussed shipping legislation and had decided to defer action on the subject until after the holiday recess. In the meantime, he said, members of the committee would consider the various bills and be prepared to take action early in January. If at that time the committee favors legislation along the lines of the bill reported out by the committee at the last session, providing for a replacement program and prohibiting the sale of any new government ships without the consent of Congress, Senator Jones said, it is unlikely that any further hearings will be held on shipping legislation. He thought that at least a bill similar to that previously reported would be favored by the committee.

Representative Wood of Indiana on the opening day of the session introduced H. R. 2 "to promote, encourage and develop an American merchant marine in connection with the agricultural and industrial commerce of the United States, provide for the national defense, the transportation of foreign mails, the establishment of a merchant marine training school and for other purposes." In a statement explaining the purpose of the bill Representative Wood said that it contains no radical suggestions and in the main does three things: He proposes first to remove from the registry of commercial tonnage those ships unnecessary for the maintenance of lines of transportation service already established. He proposes that they shall be maintained as "vessels in the public service of a non-merchant class."

The second proposal is to aid operators to meet the cost of construction of new vessels, by providing that when the Shipping Board is furnished with copies of contracts entered into by an operator and shipbuilder, indicating that they are ready to proceed upon the construction of a new vessel, the board shall enter into contracts with each of the parties, receiving from the operator a guaranty that the newly constructed vessel will be maintained in a stipulated service for a term of not less than ten years. This guaranty of service is the government's requirement, Mr. Wood says, for the interest it shall have in the vessel, which is to be provided for in the contract with the shipbuilder, whereby the government undertakes to pay for the costs of labor and material only which may be in excess of the costs for like items entering into the construction cost of a similar ship in foreign countries. In other words, the government would undertake a portion of the costs of construction in return for a guaranteed service for a term of years.

The third proposal relates to the establishment of a merchant marine training school, providing for appointments from every section of the United States, a prescribed course of training with compensation and the establishment of a retirement or pension fund. Graduates of this school would be qualified and induced to stay in the merchant marine, making it their career. "The prompt enactment of this bill," Representative Wood said, "should forcibly bring to the minds of our friends across the seas that within a few years, or as soon as new vessels can be constructed, our merchant marine and our Navy are not to be dismissed from their calculations."

Senator Jones has reintroduced both of his two alternative bills of last session, one of which, S. 743, is designed to make possible private ownership and operation by citizens of the United States of American vessels operated in foreign trade, and provides for aids to the merchant marine, while the other, S. 744, provides for a replacement program and continued government operation. In proposing the latter bill Senator Jones said he had about reached the conclusion that it presented the only practicable method of assuring permanence.

Senator Willis, of Ohio, has introduced S. 789 to exempt owners of vessels from income taxes payable on proceeds of sales of vessels, and a similar bill was introduced in the House by Representative Burton, of Ohio, as H. R. 102.

Bills providing for the establishment, operation and maintenance of foreign trade zones in ports of entry of the United States have been introduced by Senator Jones, of Washington, as S. 742, and by Representative Briggs, of Texas, as H. R. 5478.

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Senator McKellar has reintroduced a bill providing for a number of amendments to the merchant marine act, S. 837, on which no action was taken at the last session.

Senator Borah, of Idaho, has introduced S. 1295, to enact into law provisions of the so-called Hague rules.

Senator Copeland, of New York, has introduced as S. 806, a bill to amend the ocean mail act of 1891 so as to authorize the Postmaster General to make contracts for terms of five to ten years with American citizens for the carrying of mail on American steam and motor ships.

Representative Hogg, of Indiana, has introduced H. R. 6865, providing that the Postmaster General may allow for transportation of mails in American flag vessels compensation not in excess of 80 cents a pound for letters and postcards and 8 cents a pound for other articles, including parcel post. He has also introduced H. R. 6864, to authorize the Postmaster General to require steamship companies to carry mails when tendered.

Senator Jones has also introduced S. 1608, authorizing and directing the discontinuance of the transport service of the Army and Navy, in whole or in part, and the transfer of transport vessels to the Shipping Board. The bill also would authorize the making of contracts with owners of American vessels for transport service.

LARGE BUILDING PROGRAM FOR NAVY PROPOSED BY SECRETARY WILBUR

An ambitious program of naval construction, to extend over a period of possibly five years, and costing $725,000,000 or more, has been proposed by Secretary Wilbur of the Navy, in a letter addressed to Congress accompanied by a draft of a bill on December 14. The Secretary said afterward that the program had been approved in general by the President. The purpose of the proposed bill is to authorize the President to undertake the construction of 25 light cruisers, 9 destroyer leaders, 32 submarines, and 5 aircraft carriers, subject to the limitations of the treaty limiting naval armament, and empowering the President, in the event of an international conference for the limitation of armaments, to suspend, in his discretion, in whole or in part, any of the construction authorized. The estimated cost at this date is merely speculative, Secretary Wilbur said, but as a rough approximation he gave the unit cost of the light cruisers as $17,000,000 each, the destroyer leaders as $5,000,000 each, the submarines as $5,000,000 each and the aircraft carriers as $19,000,000 each. Under date of December 13 the director of the Budget advised the Navy Department that the proposed legislation is not in conflict with the financial program of the President. The maximum expenditure for any one year is placed at $185,000,000 and the minimum at $55,000,000, depending on the procedure to be followed after authorization.

An investigation of the construction of the airplane carriers *Lexington* and *Saratoga* by the Bethlehem Shipbuilding Corporation and the New York Shipbuilding Corporation is proposed in a resolution introduced in the House by Representative McClintic of Oklahoma, who is objecting to the amount of "overhead" expense which he says is being charged against the cost of the carriers by the builders

Announcement has been made by the Division of Simplified Practice of the Department of Commerce that the next meeting of the executive board of the American Marine Standards Committee, the annual meeting, will be held at Washington on January 23.

Shipbuilding in American Yards for 1927

Although the tonnage output is 43 percent higher than for 1926, the tonnage under construction shows a loss of 45 percent over the preceding year

A CONSIDERABLE increase in the amount of tonnage built in the United States during the year 1927 over that of the previous year is shown by statistics compiled by MARINE ENGINEERING AND SHIPPING AGE. The number and tonnage of ships under construction at this time, however, are less than for any year since the war period.

During the year 694 merchant vessels of all types were delivered with a total of 395,620 gross tons. These figures were reported by 51 shipyards. Forty-three of the yards report 239 merchant vessels of 149,270 gross tons now under construction. The output in 1927 represents an increase of 43 percent over that of 1926 and 52 percent over the tonnage built in 1925. The tonnage now under construction, however, shows a loss of 45 percent over that on order at the end of 1926. Fifty-one yards were active during the year as compared with 41 in 1926, 49 in 1925 and 33 in 1924. The 43 yards reporting orders on hand compare with 37 last year and 33 two years ago.

Of the vessels delivered in 1927, 45½ percent were propelled by steam machinery; 15½ percent consisted of motorships and the remaining 39 percent were barges or other non-propelled craft. Of the construction now on hand, 46 percent is steam, 28 percent is motorship tonnage while barges and other non-propelled craft represent 26 percent.

Of the tonnage built in 1927, Atlantic coast and Gulf shipyards constructed 50 percent; Great Lakes yards, 22 percent; western river plants, 20 percent and west coast yards 8 percent.

Seventy-six percent of the tonnage now under construction is being handled in Atlantic coast and Gulf yards, 8.75 percent at Great Lakes yards, 2.75 percent at west coast yards and 12.5 percent on the western rivers.

The outstanding vessel of the year completed and delivered was the 15,000-gross ton passenger liner *Malolo* for the Matson Navigation Company, San Francisco, Cal. This ship was built at the William Cramp & Sons' Ship & Engine Building Company, Philadelphia. The completion of the vessel also marked the closing of the Cramp yard. The final month of the year brought forth the reestablishment of the Bath Iron Works of Bath, Maine, as a shipyard.

The development of electric drive for ships reached a point during the year where the use of both turbine electric and Diesel electric machinery will be extended in merchant ship propulsion in the future. A review of the ships being fitted with this type drive is published elsewhere in this issue.

The *California* and the *Virginia* under construction by the Newport News Shipbuilding & Dry Dock Company, Newport News, Va., for the Panama Pacific Line service of the International Mercantile Marine are being equipped with turbo electric drive. The former is to be delivered this

Generated on 2024-09-12 14:17 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

month and placed in intercoastal service. Construction on the latter vessel is now getting well under way. It is expected that the third liner of the *California* class will be ordered during the coming year.

Among the passenger ships built during the year and delivered were the steamships *Yarmouth* and *Evangeline* each 378 feet in length built by the William Cramp & Sons' Ship & Engine Building Company for the Eastern Steamship Company, Boston, Mass. At the Newport News Shipbuilding & Dry Dock Company the 535-foot Red D steamship *Caracas* was completed as were also the 6,000-ton freight and passenger ships *Iroquois* and *Shawnee* for the Clyde Line of New York. The Federal Shipbuilding Company, Kearny, N. J., will deliver the Southern Pacific Company steamship *Dixie* this month which, with the exception of the *Virginia* and 3 passenger steamers for Chesapeake Bay and coastal service, will complete the orders on hand in east coast yards for passenger ships.

On the west coast the same lack of orders prevails, the only passenger vessel under construction being the Inter-Island Steam Navigation Company ship at the Union plant, San Francisco, of the Bethlehem Shipbuilding Corporation, Ltd.

The greater proportion of the 87,000 odd gross tons of ships built and delivered by Great Lakes shipyards during the year was in the form of large bulk freighters. With the completion of these only about 3 medium sized ships remain as a start for the year 1928. The remainder of the Great Lakes tonnage under construction is for barges, tug boats, car ferries and other miscellaneous small craft.

Six tankers varying from about 6,000 to 10,000 tons capacity were ordered during the year in American shipyards but, with the exception of these and the passenger ships mentioned above, the only remaining construction now under way consists of miscellaneous craft for harbor, river and coastwise service including ferry boats, dredges, barges, car floats, tug boats and the like. Pleasure yacht construction received great impetus during 1927 and several seagoing yachts, varying in size from 150 feet in length to 340 feet, were ordered in American yards. Bids are now being received on 7 additional Diesel and steam-driven yachts of medium or large size and it is expected that orders will be placed for most of them in the near future.

Taken as a whole the year 1927 presented a better shipbuilding picture than the preceding two or three years mainly because of the fact that passenger ship tonnage and Lake freighter tonnage were carried over for completion. No new orders of any size were given the yards to replace the tonnage completed so that at this time the tonnage on order has fallen below that of any year since the war period. The only saving feature of the situation has been the placing of numerous Coast Guard and Navy Department contracts. In the form of government contracts the larger private yards will have a fairly comparable basis with other years on which to commence the 1928 program. The Coast Guard cutter *Northland* was completed at the Newport News Shipbuilding & Dry Dock Company yard and six additional Diesel electric drive cutters were ordered to be built at the Fore River Plant, Quincy, Mass., of the Bethlehem Shipbuilding Corporation, Ltd.

In the closing months of the year, the American Brown Boveri Electric Corporation, Camden, N. J., delivered the 33,000-ton airplane carrier *Saratoga* to the Navy Department and at the Fore River plant, of the Bethlehem Shipbuilding Corporation, Ltd., the sister ship, the *Lexington*, was brought to completion and delivered. Of the two 10,000-ton scout cruisers under construction at the beginning of the year, the *Salt Lake City* originally contracted for with William Cramp & Sons' Ship & Engine Building Company was transferred to the American Brown Boveri Electric Corporation yard at Camden, N. J., by the Navy Department after work at the former yard had ceased. Of the six 10,000-ton scout cruisers ordered by the Navy Department in 1927, four were awarded to private shipyards;

Table I—Merchant Vessels Completed in 1927

	Number of Vessels	Total Gross Tonnage	Total Horsepower
William G. Abbott Shipbuilding Company	3	.....	.....
Alabama Dry Dock & Shipbuilding Company	5*	3,500	.....
Albany Boat Corporation	6	30	600
American Bridge Company	131*	53,000	.....
American Brown Boveri Electric Corporation	46	15,035	11,000
American Shipbuilding Company	9	54,569	17,500
Baker Construction Company	3	228	3,360
Bethlehem Shipbuilding Corporation, Ltd.	7	15,328	4,150
Buffalo Marine Construction	2	.....	.....
Ira S. Bushey & Sons, Inc.	19	7,490	180
Charleston Dry Dock & Machine Company	3	60	700
Wm. Cramp & Sons Ship & Engine Building Company	3	26,329	36,000
Crowinshield Shipbuilding Company	1	108	360
Defoe Boat & Motor Works	1	464	1,200
Delaware Bay Shipbuilding Company	1	70	100
Dravo Contracting Company	121	36,137	.....
Elizabeth City Iron Works & Supply Company	1	146	120
B. H. Elliott, Inc.	6*	.....	.....
Federal Shipbuilding Company	12	20,350	4,000
General Engineering & Dry Dock Company	4	3,611	5,400
Gildersleeve Shipbuilding Company	13	4,225	.....
Great Lakes Engineering Works	2	12,991	4,000
Great Lakes Towing Company	2	198	1,500
Harbor Boat Building Company	7	330	610
Howard Shipyards & Dock Company	38*	4,162	180
Hudson Shipbldg. & Repair Company	1	180	200
Robert Jacob, Inc.	2	159	480
Jakobson & Peterson, Inc.	8	1,870	660
J. C. Johnson Shipyard	19*	153	490
Kruse & Banks Shipbuilding Company, Inc.	1	100	150
R. Lenahan Company	14	5,233	.....
Manitowoc Shipbuilding Corp.	3	7,541	10,500
Marietta Manufacturing Company	51	22,150	2,250
Marine Iron & Shipbuilding Company	6*	.....	.....
Midland Barge Company	1	75	80
Moore Dry Dock Company	10	20,580	20,400
Nashville Bridge Company	27	7,950	.....
Newport News Shipbuilding & Drydock Company	6	15,783	21,700
Pacific Coast Engineering Company	1	.....	.....
Pusey & Jones Company	1	1,860	2,700
Riter-Conley Company	60*	9,000	.....
San Diego Marine Construction Company	4	80	350
Southern Shipyard Corporation	1	320	200
Staten Island Shipbuilding Company	6	3,483	7,490
Sun Shipbuilding & Drydock Company	9	27,388	8,500
Tampa Engine & Shipbuilding Company	3	.....	.....
Toledo Shipbuilding Company	2	11,411	5,000
Vinyard Shipbuilding Company	6	150	990
Charles Ward Engineering Works	3	773	1,680
Winslow Marine Railway & Shipbuilding Company	1	732	750
William E. Woodall & Company	2*	288	.....
Total	694	395,620	175,530

Table II—Merchant Vessels Now Under Construction

	Number of Vessels	Total Gross Tonnage	Total Horsepower
Alabama Dry Dock & Shipbuilding Company	5*	3,400	.....
Albany Boat Corporation	1	25	1,100
American Bridge Company	14*	7,000	.....
American Shipbuilding Company	2	7,800	3,400
Bethlehem Shipbuilding Corporation, Ltd.	10	18,369	26,300
Ira S. Bushey & Sons, Inc.	5	1,478	360
Crowinshield Shipbuilding Company	1	.....	360
Dauntless Shipyard, Inc.	1	.....	.....
Defoe Boat & Motor Works	1	514	1,300
Dravo Contracting Company	15	4,265	.....
Federal Shipbuilding Company	1	8,000	8,000
General Engineering and Drydock Company	1	670	1,200
Gildersleeve Shipbuilding Company	2	650	.....
Great Lakes Engineering Works	7	4,230	2,200
Great Lakes Towing Company	2	198	1,500
Haff's Marine Railways & Boat Building	1	.....	.....
Harbor Boat Building Company	3	210	420
Howard Shipyards and Dock Company	1	195	220
Robert Jacob, Inc.	2	.....	2,000
Jakobson & Peterson, Inc.	2	500	.....
J. C. Johnson Shipyard	2	260	.....
Kingston Dry Dock & Construction Company	7*	2,950	.....
R. Lenahan Company	3	972	.....
Manitowoc Shipbuilding Corporation	2	.....	1,500
Marietta Manufacturing Company	24	11,600	3,000
The Matthews Company	80	.....	.....
Midland Barge Company	1	500	600
C. A. Morse & Son	4	.....	.....
William Muller Shipyard	..	.....	.....
Nashville Bridge Company	1	75	160
New London Ship and Engine Company	1	140	500
Newport News Shipbuilding and Drydock Company	4	46,900	30,500
Norfolk Shipbuilding and Drydock Corporation	1	50	60
Pacific Coast Engineering Company	5	.....	.....
Pusey & Jones Company	3	4,480	6,800
Sharpley Marine Railway	1*	60	.....
Spear Engineers Corporation	2	2,088	.....
Arthur D. Story	10	911	1,680
Sturgeon Bay Shipbuilding Company	2	140	350
Sun Shipbuilding and Drydock Company	2	19,000	4,200
Todd Shipyards Corporation	2	1,300	600
Vinyard Shipbuilding Company	2	48	600
Charles Ward Engineering Works	3	292	650
Total	239	149,270	99,200

*Barges or non-propelled craft.

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

two going to the Newport News Shipbuilding & Dry Dock Company; one to the American Brown Boveri Electric Corporation and one to the Bethlehem Shipbuilding Corporation, Ltd.

Electrical Developments in the Marine Field During 1927

By D. W. Niven*

SINCE the first commercial application of electric propulsion in 1908, when the Chicago fireboat, *Graeme Stewart,* was placed in commission, there has been a consistent growth in the number and size of electrically-propelled craft.

At the close of the year, 1927, there had been placed in commission, or were under construction, a total of 118 electrically-propelled vessels of various types, ranging from river towboats and small yachts to the largest types of seagoing ships. The equipment of these craft aggregated more than 700,000 shaft horsepower, about 92 percent of the primary power being supplied by turbines and 8 percent by Diesel engines.

The General Electric propelling equipments constitute about 84 percent of the total shaft horsepower involved and consist of 29 turbine-electric drives totalling 566,250 shaft horsepower and 38 Diesel-electric drives totalling 33,800 shaft horsepower.

The outstanding event of the year was the completion and installation of turbine electric propelling equipment for the Panama Pacific liner *California,* the largest passenger ship ever built in the United States and the largest electrically-driven ship of her class in the world.

The maximum energy delivered to her propeller shafts is 17,000 shaft horsepower and a speed of 18 knots can be maintained with this power input. At the cruising speed of 16.5 knots, the output of the turbine-generator is 13,500 shaft horsepower, and at this speed the ship has a cruising radius of 15,400 miles.

The second of the turbine electric self-unloading limestone carriers for the Bradley Transportation Company went into service in July, 1927, and, in addition to being the largest bulk freight carrier on the Great Lakes, is of interest due to the unusual features of her equipment.

The power developed by the machinery of this vessel is normally about 4,200 shaft horsepower, but the turbine generators are capable of a maximum continuous output of 4,800 shaft horsepower.

Early in the year the new Diesel electric Coast Guard cutter, *Northland* was launched, and is now serving on patrol in the Alaskan waters as the successor of the famous patrol cutter *Bear* which was built in 1874.

The main engine room equipment consists of two Diesel-engine-driven generators, each rated 410 kilowatts, 250 volts at 200 revolutions per minute. The ship will develop a speed of 12 knots with her single propeller operating at 120 revolutions per minute and the motor developing 1,000 shaft horsepower. The control is located in the engine room and is of the variable voltage type.

Four large double-end Diesel-electric ferry-boats were completed for the Southern Pacific Company for service in San Francisco Bay. The main power plant in each of these boats consists of four 450 horsepower Diesel engines, each direct connected to a 275 kilowatt, 250-volt, shunt wound, separately excited, direct current generator. These generating sets operate at 230 revolutions per minute and the generators are connected in series so that they supply current at 1,000 volts to the propeller motors, which are of double-unit construction, shunt wound, and separately excited. The continuous duty rating of these motors is 1,250 shaft horsepower at 100 to 130 revolutions per minute, with 500 volts on each armature. Equipment was under construction for an electrically propelled packet boat designed to carry 250 tons of package freight at a speed of 12 miles per hour between New Brunswick (N. J.) and points in and adjacent to the harbor of New York. The power plant will consist of two 250 horsepower, 300 revolutions per minte, Diesel engines driving direct-connected, main and auxiliary generators. The single propeller will operate at speeds up to 175 revolutions per minute, and the driving motor will develop 400 shaft horsepower.

A field hitherto untouched by Diesel electric propulsion was opened by the decision of the United States Shipping Board to authorize the conversion of cargo boats with this type of drive. In each of the three ships to be so converted, the engine room equipment will comprise four direct current Diesel engine driven generators, each provided with an auxiliary generator mounted on the same shaft as the main generator. The main propelling motor will be rated 4,000 shaft horsepower at 70 revolutions per minute.

Another application of Diesel electric drive was inaugurated by the Bureau of Lighthouses (of the United States Department of Commerce) by its decision to adopt this method of propulsion for three new light ships. The equipment for each ship will consist of four 75-kilowatt main generators and two 7½ kilowatt separately driven auxiliary generators, the single propelling motor for each ship being rated 350 shaft horsepower at 300 revolutions per minute.

* Manager federal and marine department, General Electric Company, Schenectady, N. Y.

Shipping Board Invites Steamship Owners to Attend Hearings on Merchant Marine Problems

AMERICAN steamship owners in all parts of the United States are invited by the Shipping Board to take part in a full discussion of present American merchant marine problems at a series of hearings to be held before the board commencing January 10. This invitation, Chairman O'Connor states, is extended in accordance with the following resolution adopted by the board:

"Whereas, there are several bills pending before the Congress affecting the present status and permanency of the American merchant marine, and upon which the Shipping Board is called upon for its opinion and criticism, and;

"Whereas, the general subject presents so many angles and view points of the American steamship and other interests, particularly as regards the government owned and operated vessels and those American vessels in private hands

"Therefore be it resolved, that in order to bring about a clearer understanding of the position of the private steamship interests and for the purpose of obtaining advice and suggestions affecting the upbuilding of our merchant marine in hope of more nearly composing the different ideas on this problem so vital to the public welfare, the chairman is hereby authorized to request the American steamship owners on the Atlantic, Gulf, Pacific and Great Lakes to send a representative for the purpose of conferring with the Shipping Board in a free and full discussion of this matter, the hearings to commence January 10, 1928."

Shipping Conference Proposed

The Secretary of Commerce stated orally December 29 that he was considering the calling of a shipping conference for the purpose of achieving better organization in the shipping industry. He said that plans are only in a formative stage and that no date for such a conference has been set, if it will be called.

"The request has come," said Mr. Hoover, "from the steamship associations to get better coordination in that industry. They propose a conference not for the purposes of shaping policy but for better organization in the shipping industry. That organization relates to obtaining greater support from American shippers."

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Scales Instead of Curves for Ships' Forms

Method proposed for facilitating the determination of the properties of ships' forms by the officers of the ship

By E. Klingh'r

THE recently issued "First and Tentative Report of the Special Committee on Stability and Loading of the American Marine Standards Committee," among other recommendations to regulate and govern the stability of new passenger vessels, required a report of the inclining experiment data of the vessels. This report of the inclining experiment, to conform to regulations and requirements, includes a set of curves of form of the vessel, drawn to a natural scale and to consist of the following:

(a) Total molded displacement, in tons at 35 cubic feet per ton, including bossings.
(b) Total displacement, in tons at 35 cubic feet per ton, including shell and all appendages.
(c) Total displacement, in tons of 35.9 cubic feet per ton.
(d) Vertical position of center of buoyancy above base line for total molded displacement, including bossings.
(e) Vertical position of transverse metacenter above base line for total molded displacement, including bossings.
(f) Block co-efficient.
(g) Tons per one inch.
(h) Longitudinal position of center of buoyancy, even keel for total molded displacement, including bossings and rudder.
(i) Longitudinal metacenter above base line for molded displacement, including bossings and rudder.
(j) Moment to change trim one inch.
(k) Change in displacement due to one foot change of trim.

Such a set of curves of form is shown in Fig. 1. They are usually plotted on a sheet 18 inches by 32 inches, and the scales of tons and mean draft are arranged to fill a sheet of that size as nearly as may be convenient. The displacement curve is laid off on a horizontal scale, starting with zero at the left and unit numbers at the bottom. The mean draft is laid off on a vertical line, starting with zero at the bottom and unit numbers at the extreme right and left and in the middle of the sheet. Convenient scales with unit numbers on the top of the sheet for the other curves (except the vertical center of buoyancy and the vertical transverse metacenter) must be adopted to conform to the size of the sheet and should occupy some relative position to each other, so as not to be overcrowded and to be easily distinguished one from another.

The vertical position of center of buoyancy and the vertical transverse metacenter are laid off from a 45-degree base line, which makes it convenient to plot the center of gravity of the ship in any condition of loading against them and the G.M. can be read or scaled off directly (see Fig. 2).

Sometimes the metacenters are laid off as picked off from the calculation sheets as the metacenter radii (B.M.), which necessitates the reading of the center of buoyancy, to be added to it, to obtain the metacenters above the base line. It is very important that these centers be marked metacenter radius or metacenter above base, the latter is the more convenient form to use, as explained above.

To the designer and naval architect, curves, without any doubt, appeal as the clearest and best method of setting

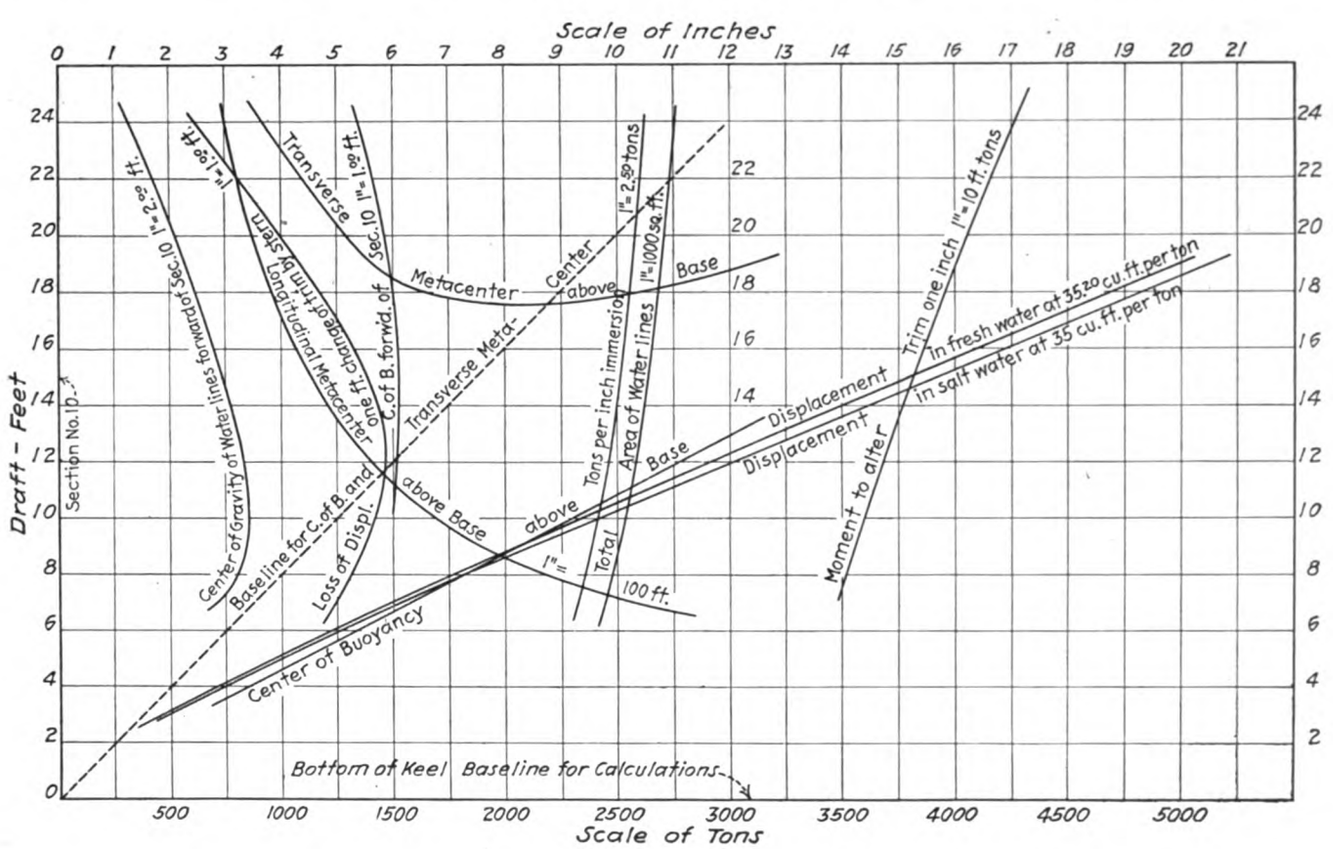


Fig. 1

Generated on 2024-09-12 14:20 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

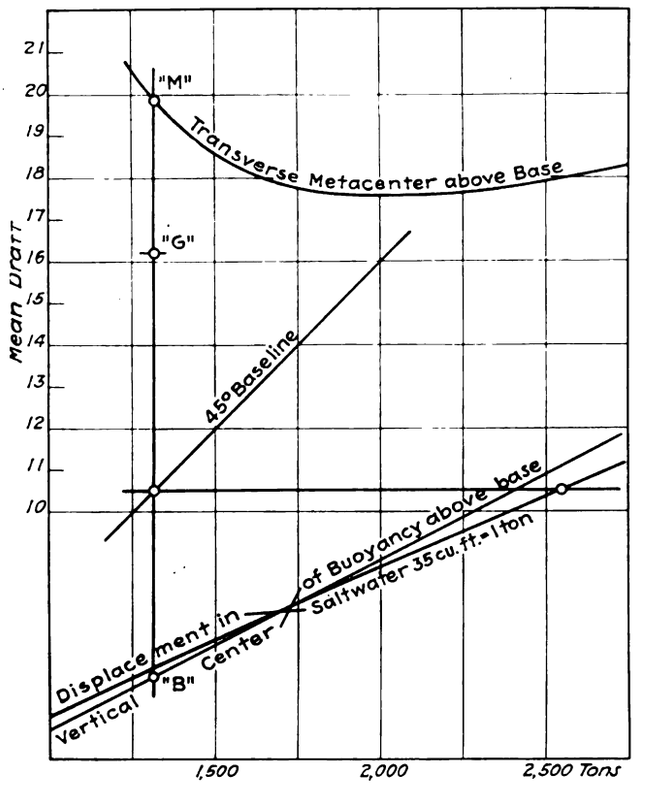


Fig. 2

Mean draft, 10 feet 6 inches; displacement in salt water, 2,550 tons; center of buoyancy above base, 6 feet; transverse metacenter radius (B.M.), 13.90 feet; transverse metacenter above base, 19.90 feet; center of gravity above base (C.G.), 16.20 feet; G.M., 3.70 feet.

forth any properties which depend for their value upon a ship's form. Experience and usage add to their quick interpretation, reading and locating; but it must be remembered that these curves are intended also to be used by the ship's officers. In a way they are the tools they have to work with. These officers as an average are not familiar with curves or diagrams of this character and their intelligent use presupposes a fair working knowledge of fundamentals. While formerly, with coal burning ships, the ancient rule of thumb governed in loading their ships, and when under way the engineer burnt up his coal, so as to keep the ship at about the same trim. He also used the coal equally from both sides to prevent a heeling. In this way there was nothing much to worry about the stability of the ship. With the advent of oil burning ships, these conditions have changed. One factor has entered here which must be reckoned with, and that is the loss of G.M. due to the free surface of oil and water, which the officers of the ship while under way have to take care of. Also, the coal bunkers were fairly high up and the emptying of them did not as a whole influence the center of gravity of the ship very much. With oil, which is mostly carried in the double bottoms with a low center of gravity, the consumption of the fuel influences and raises the center of gravity of the ship and thereby reduces the G.M. This is a very important factor to be reckoned with, and an unusual behavior of the ship must be immediately and quickly investigated and corrected.

Experience has shown that it is usually difficult for ship's officers to read the desired information from the ordinary displacement sheet, particularly the transverse metacenter from the 45-degree base line, one of the principal functions he has to deal with and which should be read as closely as possible. The interpretation of the various

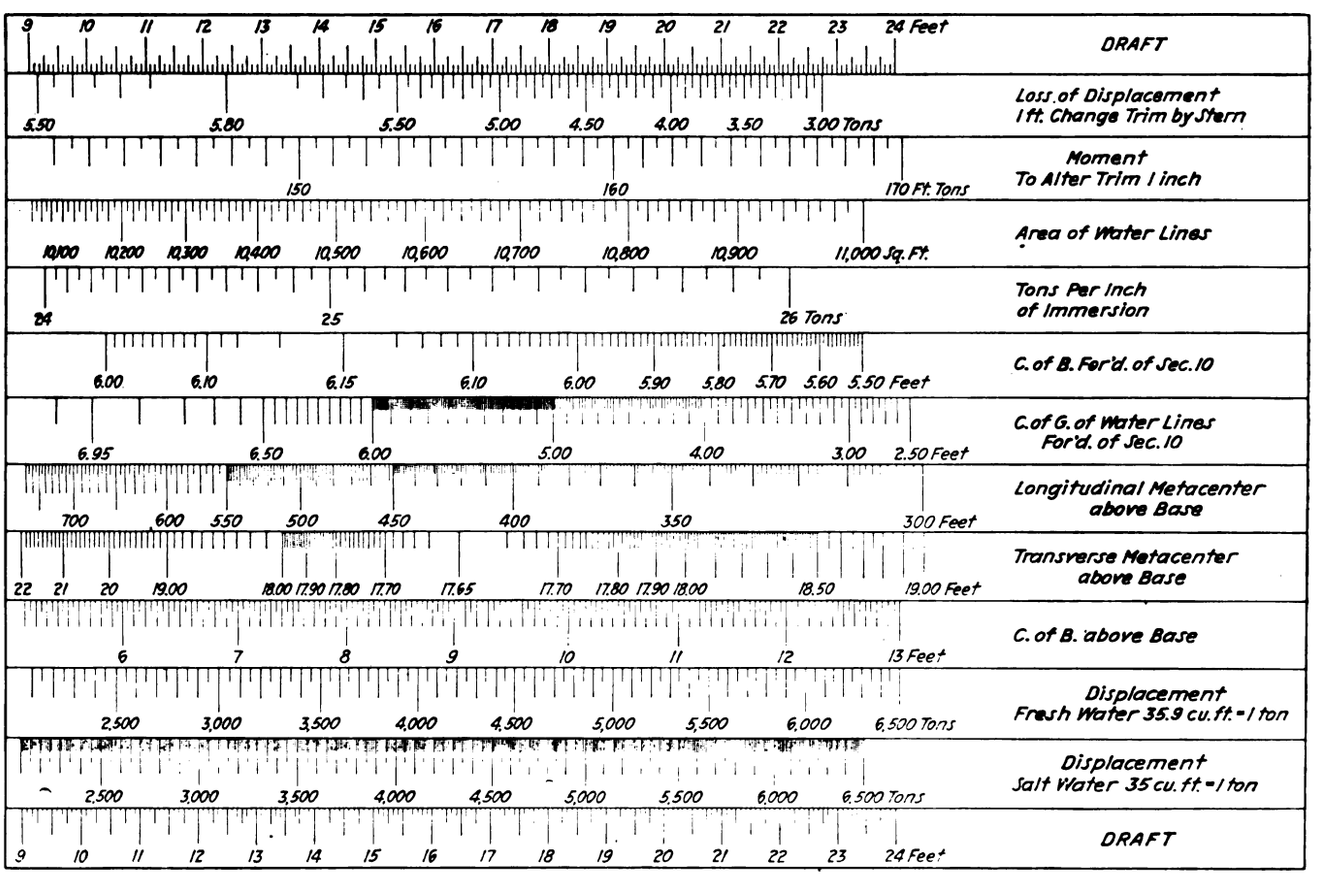


Fig. 3

Generated on 2024-09-12 14:18 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

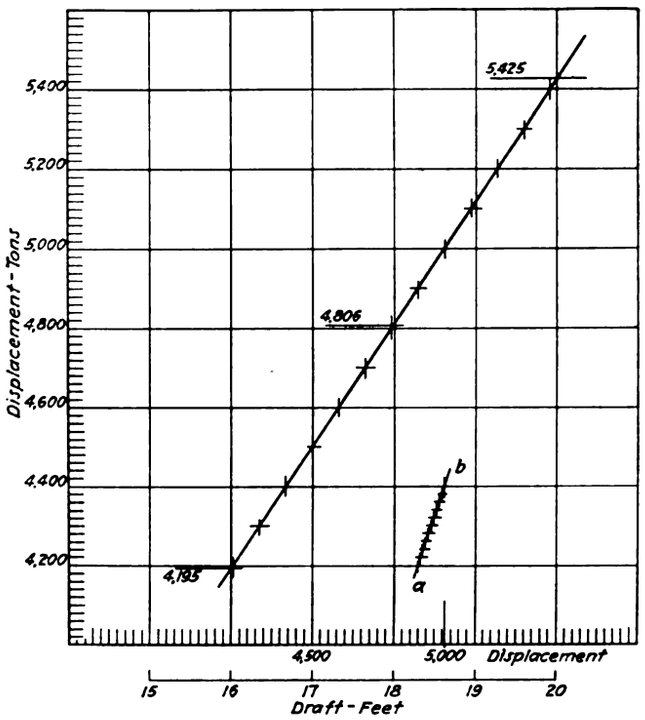


Fig. 4

scales and the required transfer from one curve to another is confusing and frequently results in error. The average ship's officer has an abhorrence of figures and looks dubious at curves. If these are unintelligently used, as would likely be the case, they would become a source of danger, and must lead to destruction instead of safety of the ship. Their intelligent use requires a fair knowledge of fundamentals and arithmetical training, which, of course, the wideawake officer will acquire to hold and advance his position. Undoubtedly, the best results would be obtained by supplying this knowledge in a clear and readily understood form, rather than as a maze of curves. In other words, a simpler, easier and quicker mode of reading, or tools to work with, is desirable.

With this in view Fig. 3 was devised, consisting of a series of parallel scales of the several functions of curves plotted against a draft scale at the top and the bottom of the sheet. By connecting the two draft scales at any draft by a line, the various characteristics of each function can be read off directly at the point of intersection. There is no excuse for getting on the wrong line or making an error in the conversion of inches into tons and foot tons. Each characteristic is plainly defined. Each function is read almost instantaneously, and that is as it should be, in case of a quick decision to be made on unusual behavior of a ship encountering bad weather or when the ship is in a very light condition.

The results of calculations are plotted first as curves, similar to those in Fig. 1. This is done to insure their fairness, as any unfairness indicates a probable error in the calculations. The curves are conveniently laid off on standard cross section paper, 10 by 10 to the inch, but in a reverse order from that in Fig. 1; that is, the draft scale is laid off horizontally and all the other curves are plotted against it.

Figs. 4, 5, 6 and 7 show in a detailed manner the divisions and subdivisions of the curves and it can readily be seen that the subdivisions can be carried down to a very small denomination and can be made any denomination.

In Fig. 4 the calculated displacement at 16, 18 and 20 feet draft is laid off as 4,195, 4,806 and 5,425 tons, respectively.

At the intersection of the curve with horizontal lines of cross section lines of the paper, exact spacings for 100 tons displacement are drawn down vertically against the draft scale. By drawing the line *a-b* the 100-ton division is subdivided into 10 parts of 10 tons each and by interpolation in reading by eye the 10-ton division can be read as close as 2 tons.

Fig. 5 shows the transverse metacenter above the base laid as calculated for 12, 14, 16 and 20 feet draft as 18.60, 17.86, 17.65 and 17.93 feet, respectively. It will be seen at a glance how the divisions and subdivisions are carried out by the intersections of the curve by the horizontal lines

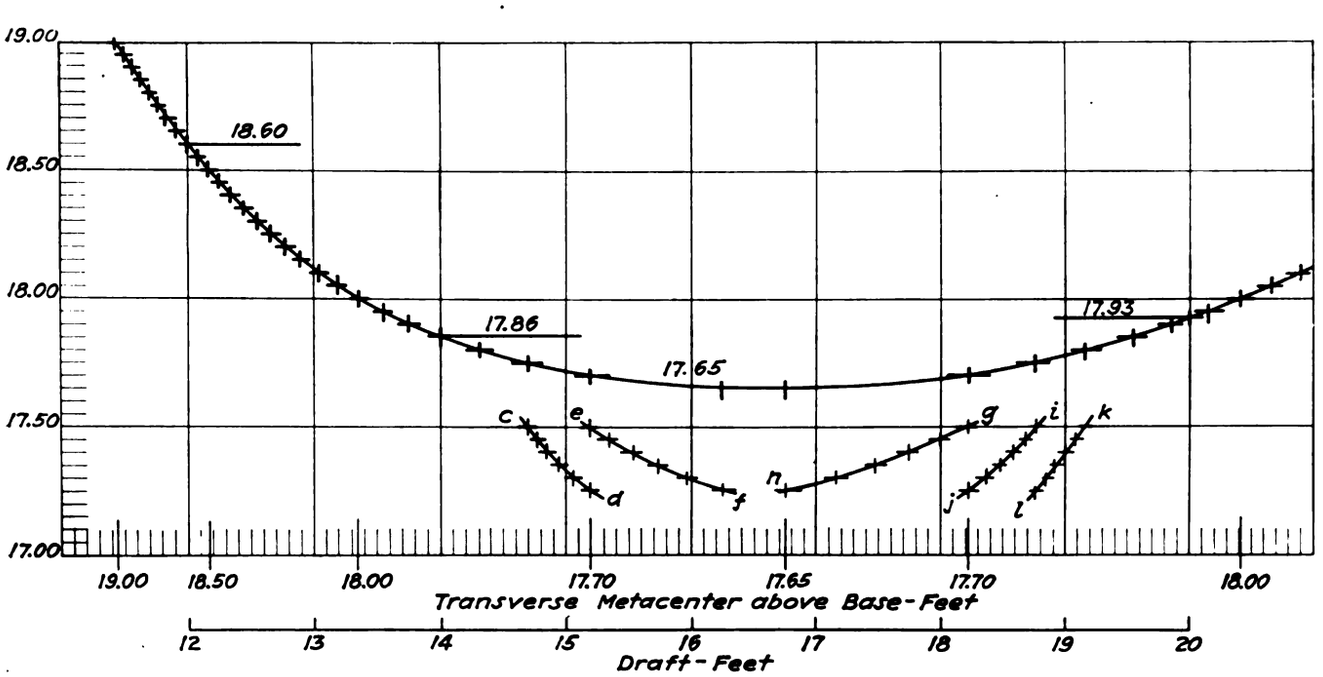


Fig. 5

Generated on 2024-09-12 15:01 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

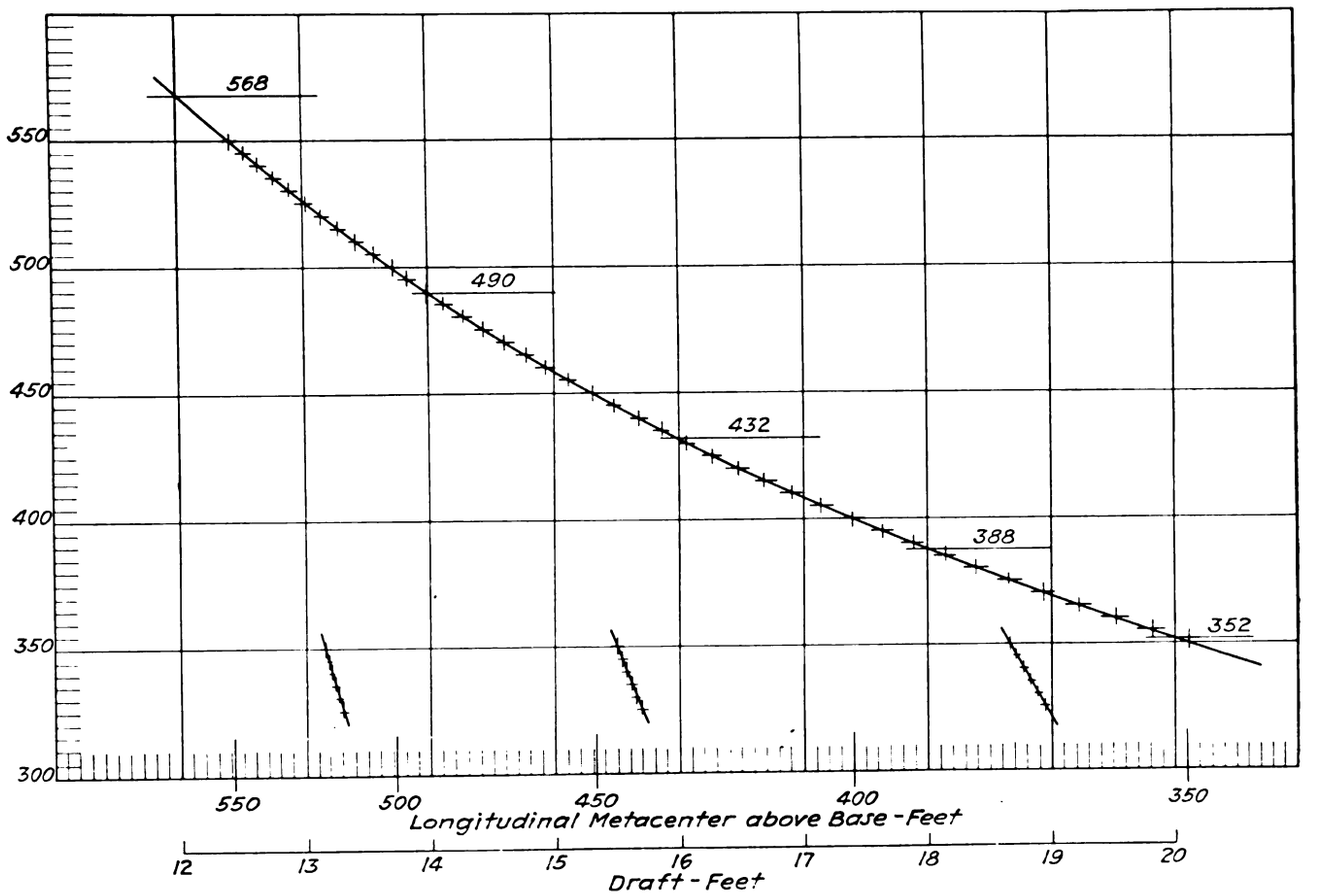


Fig. 6

of the cross section paper. It will be noticed that the subdivisions are carried down to one-hundredths of a foot, which is closer than it could be read off from the curves on Fig. 1. Care has to be taken in subdividing that the lines *c-d, e-f, g-h, i-j* and *k-l* are curves similar to the main curve, to insure that the divisions are carried out progressively; otherwise, if the line is made straight, the divisions would be equal and not progressing or harmonic.

Fig. 6 shows the longitudinal metacenter curve above the base as calculated for 12, 14, 16, 18 and 20 feet as 568, 490, 432, 388 and 352 feet, respectively: the main divi-

(*Continued on page 33*)

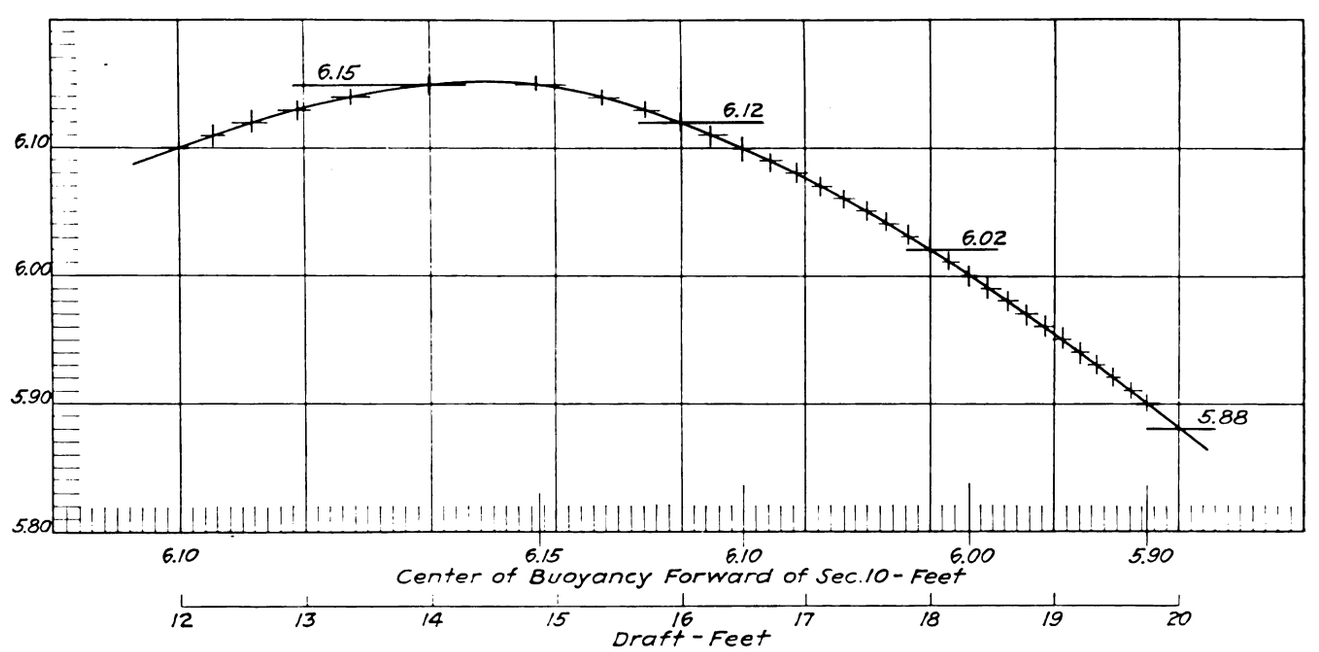


Fig. 7

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Smoke and Flame from Fuel Oil Combustion

By R. C. Brierly

In boiler operation, when burning fuel oil with mechanical pressure atomizers, one of the principal means of gaging the type of combustion obtained is the appearance of the smoke. Considerable has been written on this subject, but it is believed that an even closer scrutiny may be of assistance. Furthermore, most of the data on this subject have been derived from operation with coal in stoker-fired installations, rather than from operation with fuel oil atomized by mechanical pressure atomizers. Consequently, the information given in this article will be found of special value to engineers operating oil burning vessels.

ALL smoke is composed of carbon or hydrocarbon particles, and visible gases, such as sulphur dioxide.

The principal stack conditions observed in oil fired boiler operations are:

(1) Black smoke of various densities.
(2) White smoke.
(3) Streaked black and white smoke.
(4) Puffs of black or white smoke.
(5) Thin light brown haze.
(6) No smoke from the stack.

The meaning of these various stack conditions will be dealt with individually, as follows:

Black Smoke

Black smoke is caused primarily by insufficient air, as nearly everyone knows, but may be due to other causes, in which insufficient air is only a factor, or may not be in any way responsible.

Lighting off a cold boiler generally causes black smoke to rise from the stack. The smoke in this instance is generally due to the carbon particles from the partially burned oil coming in contact with the cold heating surfaces and cold brick work, their temperature thus being forced below the point of ignition. This condition is not caused by insufficient air, and the introduction of high excess air would tend rather to produce further chilling at such a time. Furthermore, if relatively viscous oil is being ignited, and steam for the purpose of heating the oil in the oil heaters is not available, the boiler, when first lighted off, has to be fired with oil in such a viscous state that proper spraying even at high pressure is impossible.

Thus we have another cause for black smoke—*burning oil at too high a viscosity* (which means *thick stuff*), because of too low an oil temperature. When the oil is very thick and viscous because of not being heated to a sufficiently high temperature, the oil particles cohere strongly, and the centrifugal force necessary to break up the oil into the form of a thin mist-like cone of oil spray cannot be set up in the whirling chamber of the atomizer. In consequence of this, a *pencil*, or nearly solid stream, of oil is forced from the atomizer. Air entering the burner through the air control register cannot penetrate this stream of oil, and the carbon particles have no opportunity to unite with the oxygen of the incoming air. Black smoke results.

While the oil viscosity producing the very best atomization is not exactly known, a very good viscosity to employ, and the one with which about the best possible spray can be secured from an efficient atomizer, is approximately 150 seconds Saybolt Universal.

Even though the oil were heated to the correct temperature in order to maintain it at the proper viscosity for spraying and ample air furnished to burn satisfactorily all the oil constituents, black smoke may result because of improper intermixture of the air with the oil due to faulty adjustment of the vanes of the register, improper adjustment of the diffuser, or wrong position of the atomizer in the register.

Flame which strikes side walls, heating surfaces, or floor, tends to cause black smoke. It is sometimes possible to reduce this by carrying a high percentage of excess air, but change of method of burner operation, spray angle or design of boiler front plate on which the burners are mounted is often the only satisfactory solution of this problem.

Black smoke is objectionable because of increased operating costs principally through:

(1) Loss of B.T.U's with solid carbon particles.
(2) Loss of B.T.U.'s with invisible hydrocarbon gases, which often contain heat value in excess of 10 percent of the total potential B.T.U. as fired.
(3) Fouling of the boiler heating surfaces, necessitating frequent use of soot blowers, or taking the boiler off the line at short intervals for hand cleaning, which is expensive and attended by loss of time.
(4) Loss of heat, due to the insulating properties of carbon fouling the heating surfaces, and preventing absorption of heat by the heating surface. An indication of deposition of carbon is increased stack temperature as fouling progresses.

Other considerations demanding prevention of smoke are:

(1) Smoke prevention laws of communities.
(2) Disrepute brought upon company and the products in the community by smoke nuisance.
(3) Military necessity for smokeless operation on shipboard in time of war.
(4) Necessity of elimination of smoke on passenger vessels for the comfort of travelers.
(5) Necessity of elimination of smoke from locomotives for comfort of travelers and maintenance of property values.

White Smoke

White smoke—which is composed of partially distilled hydrocarbon compounds—is caused practically entirely by high percentages of excess air. This air tends to chill the oil constituents so greatly that not even the hydrogen has a chance to burn out and liberate the carbon particles for combustion.

White smoke is objectionable on account of the losses which occur when it is present. These losses are principally:

(1) Loss due to high excess air chilling heating surfaces and brick work, and B.T.U. passing into this excess to heat it from fireroom temperature to stack temperature.
(2) Loss due to unconsumed solid and gaseous hydrocarbons.
(3) Loss due to great weight of smoke pipe gases and high stack temperatures.
(4) Loss due to gumming up of heating surfaces with a hydrocarbon residue.
(5) Loss of heat through insulating properties of the hydrocarbon residue.
(6) Fouling of heating surfaces, necessitating frequent cleaning over prolonged periods with soot blowers, or loss of time and money for hand cleaning.
(7) Danger of flare-backs from distilling hydrocarbons on heating surfaces and in furnace.

Generated on 2024-09-12 14:51 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

White smoke can be stopped by decreasing the air supply to the furnace.

Streaked Black and White Smoke

Streaked black smoke is generally caused by one or more of the following: *Streaked sprays* are usually produced by insufficient heating of the oil, inadequate oil pressure, carbon encrusted or mechanically defective atomizer parts.

As previously noted, very viscous oil tends to produce a straight shot of oil from the atomizer tip. Even if the oil is heated to a point where it is only moderately viscous—to the vicinity of 700 seconds Saybolt Universal, for example—most atomizers will only partially accomplish their function; the oil spray is streaked by streams of only partly atomized oil, into which air for combustion can penetrate only with difficulty.

Even though the oil be at correct viscosity, insufficient pressure also tends to allow streaks to appear in the spray; this is because at relatively low pressures with mechanical pressure atomizers, insufficient centrifugal force is set up to break up the oil properly.

Well designed and properly manufactured atomizers produce non-streaked sprays with oil of the correct viscosity at 150 pounds per square inch gage pressure and sometimes less, but at higher pressures the spray will be finer and the walls of the hollow cone more thin and uniform, tending to better combustion. Pressures between 200 and 300 pounds are superior for the production of high quality spray.

The atomizer should be frequently removed from the register for cleaning, at least twice in 24 hours—and often at shorter intervals, if the operation seems to demand it. Atomizer tips and plugs, or sprayer plates, should *not* be cleaned by reaming out the orifices, grooves and whirling chamber with a specially made file end or knife. This would not have to be thought of, if atomizer parts were cared for in the proper manner, which is to soak them in kerosene, preferably immediately after removal from the register, and blowing them out with steam. If this procedure is frequently carried out, carbon will never form on the surfaces in such a manner as to make it difficult to remove. If the carbon does chance to stick fast, in spite of the kerosene and steam treatment, a hardwood stick will remove it without marring the polished surfaces.

Necessity for new sets of sprayer plates or tips and plugs within one year after they have been furnished is generally evidence of improper care on the part of the operating personnel.

When dirty (carbon-incrusted) sprayer plates are in use, streaked sprays will result; when tips that have been scored either by improper cleaning or by presence of foreign material—silica, for example—in the oil, imperfect atomization will occur. When such atomizers are used, the air entering the air control register fails adequately to penetrate the streaks, but instead drives into the thinner portions of the spray. The oil in the streaks then will be only partially burned, the carbon particles making their way up the stack as smoke streaks. With a single boiler per stack it is possible for the experienced operator to judge fairly closely from viewing the stack which atomizer is producing the smoke streaks.

Striking of the Side-Walls, Floors and Tubes.—Often the striking of flame or spray on the side-walls, floor or tubes is only slight, but sufficient to cause a steady giving-off of smoke from the point of contact, causing carbon to pass from the stack in the form of streaks. Building up of solid carbon, not readily burned away, usually occurs at the points struck. In such a case, it is well to ascertain the effect of sprayer plates or tips and plugs designed to give narrower—or in some instances wider—spray angles. In some designs of furnace, with certain types of burners installed, so much more efficient and more rapidly burning flames are produced by wide angled sprays that the oil is completely burned before impinging upon adjacent surfaces.

Striking of Individual Flames. While the interference of neighboring flames does not produce as grave difficulties as striking of the side-walls, floor and tubes, strong eddies of gas are thus sometimes established, and have a pronounced effect upon combustion, thereby necessitating changes in air admission and control.

Dissimilar Adjustment of Registers for Air Admission. In the case of watertube boilers, fired by mechanical pressure atomizers, all discharging into a common combustion space, individual control of burners should not be attempted. Dissimilar adjustments of diffusers and registers, gaging results by each burner flame, generally result in lower overall efficiency than that which would be obtained by similarly adjusting all burners in use.

Smoke of Black and White Streaks

Black and white streaked smoke may be caused not only by dissimilar air control through registers, but by the use of high excess air to eliminate black smoke—caused by striking of the refractory side-walls, floor or tubes.

Part of the oil has already had its hydrogen burned out, the free carbon particles striking the cold surfaces are chilled below the ignition temperature, but are carried through the bank and up the stack by the heavy draft utilized to produce the excess air. Simultaneously, the other part of the oil, practically unburned, is distilled and partially cracked and chilled to solid white hydrocarbon particles and carried out of the stack, giving rise to striped black and white smoke.

The remedy in this case is selection of proper sprayer plates and tips and plugs to provide combustion without striking; or, in some instances, the redesign of the front plate to more advantageously locate the burners.

Puffs of Black or White Smoke

Puffs of black or white smoke may be the result of fluctuating oil or air delivery, or intermittent recurrence of causes previously mentioned.

Thin Light Brown Haze

No burner yet designed is able to accomplish absolutely perfect intermixture of the air with the oil; if the excess amount of air passing through the registers at their best adjustment for the given rate of firing were reduced to zero, a black smoke would generally ensue, because of more or less imperfect intermixture.

Consequently, haze smoke indicates that excess air has been reduced to a minimum for the given rate and adjustment; carrying it lower would cause black smoke with attendant losses.

Procedure for Haze Smoke

Sprayer plates or tips and plugs should be selected which will deliver the required amount of oil at between 200 to 300 pounds gage pressure—for the number of burners decided upon as most efficient for use at the particular combustion rate to be run. The oil should be heated to the temperature requisite for approximately 150 seconds Saybolt Universal.

Air to the registers should be increased at the same time the rate is brought up to meet the load, but always with considerable excess air present. The load having been met, the atomizers should be adjusted in such a manner that the flames barely clear the inner face of the furnace

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

opening rings; the air should then be reduced until a faint haze smoke is issuing from the stack.

SMOKELESS STACKS

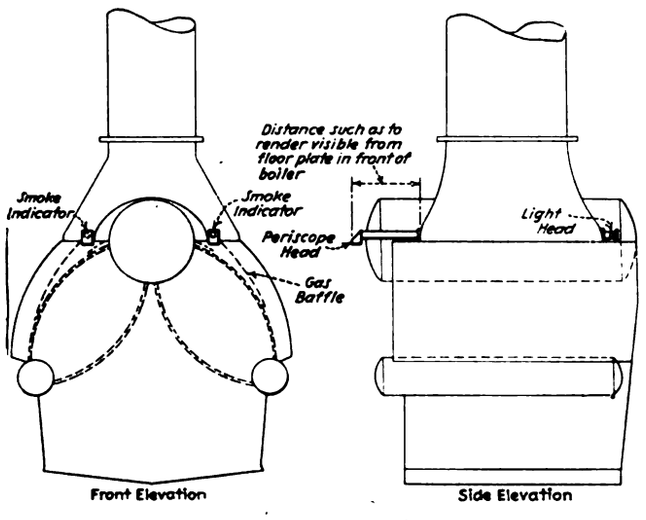
In ordinary operation with oil fuel, the absence of all smoke from the stack represents a likelihood of high percentages of excess air being present.

Percentages of excess air of 200 percent are frequently in evidence in oil-fired plants. With certain types of installation under the most careful supervision this excess can be reduced to less than 5 percent, maintaining a trace of smoke, but operation with less than 30 percent is good, as far as the excess air is concerned.

High percentages are fatal to efficient operation, because not only does this excess pass through the boiler, tending to chill the heating surfaces, but it carries large numbers of heat units out of the stack. Thus the stack temperatures increase as the percentages of excess air mount, and the heat loss with dry stack gases—which is the largest of the boiler losses, even with most efficient operation—increases greatly.

SMOKE INDICATORS

In obtaining and maintaining the proper smoke conditions, a smoke indicator is often an accessory of great value, particularly in fire rooms, from which the stack cannot be seen either directly or by mirror. Several smoke indicators of periscope type are now available in the market. Their function is, briefly, to cast a beam of light across the last pass of a boiler, this ray falling upon a diagonally placed



Typical installation of smoke indicator on express type boiler

mirror. In this glass, during day or night, the operator can see the type of smoke that is about to ascend the stack, even white smoke being brought to view as a whitish cloud. After a few hours' experience an intelligent operator can without difficulty correctly gage the type of smoke being obtained, and easily get and hold the trace smoke condition.

FLAME

In judging the type of combustion obtained with a given installation by the appearance of the flame, previous knowledge of flame appearance obtained from observations with other types of burners or on other boilers is apt to be misleading. However, somewhat vague, but at the same time quite useful, generalities may be drawn.

While a multitude of color shades—each having a meaning—are apparent when viewing the furnace through colored glasses, a certain average shade is apparent when viewing an individual flame with the naked eye. These "overall colors" of flame may be reduced to four:

(a) Brilliant flame, approximately white.
(b) Canary yellow.
(c) Reddish.
(d) Those of shades between dull to bright orange.

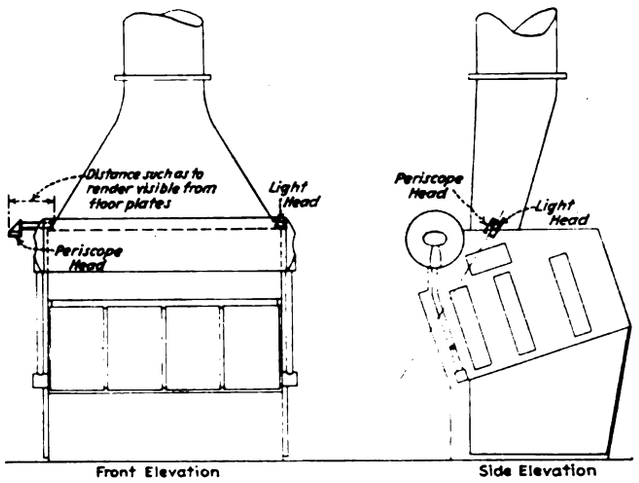
Each of these colors has a special significance, the dull to bright orange flame being, in general, preferable for mechanical pressure atomizer operation.

BRILLIANT FLAME, APPROACHING WHITE IN COLOR

Some operators confuse white fuel oil flames with the white appearance which characterizes metals which are heated white-hot, and many operators have been heard to express opinions similar to: "Now we have a white flame, which indicates high efficiency." Experimentation shows that white fuel oil flames are not of relatively high temperatures; much less do they signify increased efficiency, their white color being largely due to transparency. High percentages of excess air are always present in ordinary practice when flames of this type are in evidence, and, generally, the flame is torn in spots and sparks are blown from the sides and end of the cone of the oil spray. Close observation will reveal eddies and cavities of air in such flames, unless the intermixture of air and oil be more than usually good.

CANARY YELLOW

When canary yellow flames are in evidence, the excess air present is much less than in the case of the white flames.



Typical installation of smoke indicator on Babcock and Wilcox marine boiler

REDDISH FLAMES

Reddish flames are always proof of insufficient air and wisps of black smoke may usually be seen curling from the tails of such flames. Carbon monoxide and unburned hydrocarbon gases are practically always given off by such flames.

DULL TO BRIGHT ORANGE FLAMES

The color of flames when fair to good CO_2 percentages are obtained is between a dull and a bright orange, depending upon the thoroughness of intermixture, speed of flame propagation and the volume of the flame which is being observed.

A dull to bright orange colored flame with a thin light brown haze of smoke rising from the stack generally means fair to good efficiencies in the operation of the furnaces of the boiler.

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Model Tests With Adjustable Blade Propellers*

Results of experiments at the United States Experimental Model Basin show the effect of varying the pitch

By Captain William McEntee (C.C.) U. S. N.

IN commercial practice it is frequently found necessary to alter the pitch of the propeller after the vessel is in service. This is accomplished by rotating the blades of a "built-up" propeller through a small angle. The result is a variable pitch increasing toward the tips when the pitch is increased and decreasing toward the tips when the pitch is decreased.

Model tests were made in the U. S. Experimental Model Basin, Washington, D. C., in order to determine the effect of such a change in pitch on efficiency.

The propeller models used had the dimensions given in the table below:

Prop. No.	Diam., Inches	Designed Pitch, Inches	Designed Pitch Ratio	Diam. of Hub, Inches	Mean Width Ratio	Proj. A / Disc. A	Blade Thickness Fraction	No. of Blades
594	.... 8.00	6.00	.75	2.00	.250	.342	.05	3
595	.... 8.00	8.00	1.00	2.00	.250	.319	.05	3
596	.... 8.00	10.00	1.25	2.00	.250	.299	.05	3

The outlines and general characteristics of one of the propellers are given in Fig. 5.

Each of the three propellers was set successively to 6-inch, 8-inch and 10-inch pitch at two-thirds the radius and tested with each pitch. Hence nine tests in all were made. The latest type propeller dynamometer was used in the tests. Standard testing practice was adhered to, i. e., the propeller advanced into undisturbed water at a constant speed of 3 knots while the propeller revolutions were varied to give variation in slip. The resistance of the hub was excluded.

The test results are plotted in Figs. 1, 2 and 3, in the form of the non-dimensional thrust and torque coefficients on a basis of slip. Fair curves only are shown but very little fairing of the original spots and no cross-fairing had to be resorted to.

On Fig. 4 the efficiency curves are plotted on a basis of Taylor's ρ value. For comparison the line of maximum efficiency from Taylor's composite diagram (see *Transactions*, Vol. 32) is drawn in. It will be noticed that the

*Paper read at the thirty-fifth general meeting of the Society of Naval Architects and Marine Engineers, New York, November 10, 1927.

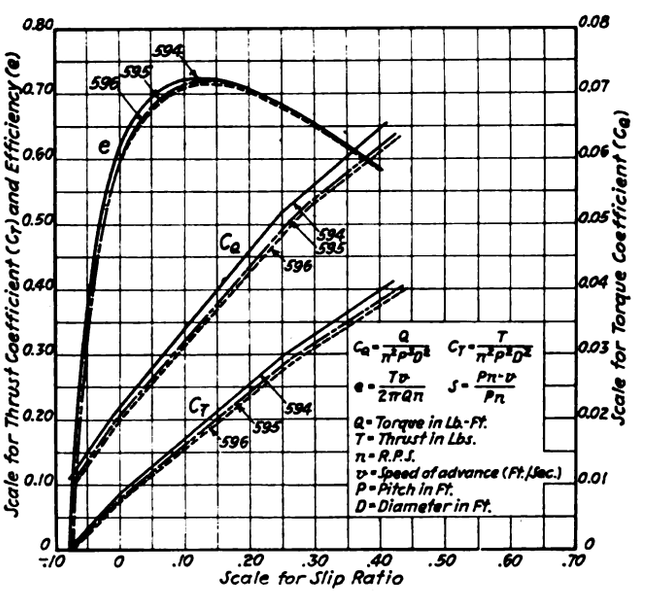

Scale for Thrust Coefficient (C_T) and Efficiency (e)
Scale for Torque Coefficient (C_Q)
Scale for Slip Ratio
$C_Q = \frac{Q}{n^2\rho^5 D^5}$ $C_T = \frac{T}{n^2\rho^2 D^2}$
$e = \frac{Tv}{2\pi Qn}$ $S = \frac{Pn-v}{Pn}$
Q = Torque in Lb.-Ft.
T = Thrust in Lbs.
n = R.P.S.
v = Speed of advance (Ft./Sec.)
P = Pitch in Ft.
D = Diameter in Ft.
594
595
596

Fig. 2.—Characteristic curves for propellers Nos. 594, 595 and 596, all set to 8-inch pitch at 2/3 radius

Diameter, 8 inches. Designed pitch for No. 594, 6 inches; for No. 595, 8 inches; for No. 596, 10 inches.

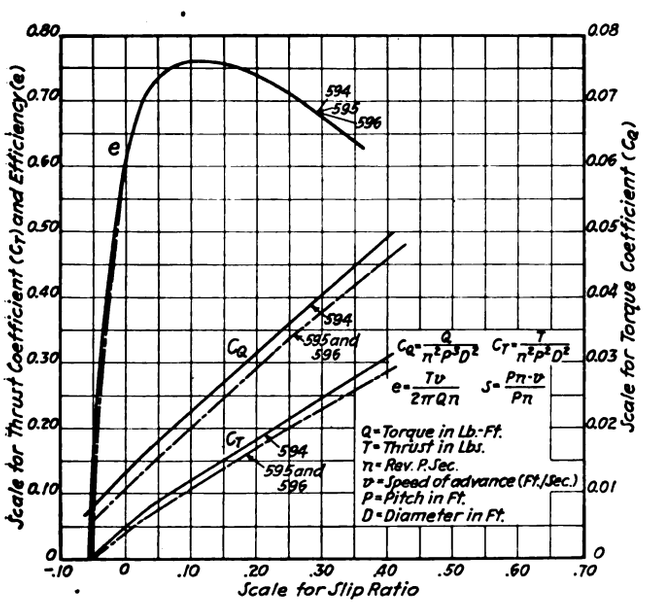

Scale for Thrust Coefficient (C_T) and Efficiency (e)
Scale for Torque Coefficient (C_Q)
Scale for Slip Ratio
$C_Q = \frac{Q}{n^2\rho^5 D^5}$ $C_T = \frac{T}{n^2\rho^2 D^2}$
$e = \frac{Tv}{2\pi Qn}$ $S = \frac{Pn-v}{Pn}$
Q = Torque in Lb.-Ft.
T = Thrust in Lbs.
n = Rev. P.Sec.
v = Speed of advance (Ft./Sec.)
P = Pitch in Ft.
D = Diameter in Ft.
594
595 and 596

Fig. 1.—Characteristic curves for propellers Nos. 594, 595 and 596, all set to 10-inch pitch at 2/3 radius

Diameter, 8 inches. Designed pitch for No. 594, 6 inches; for No. 595, 8 inches; for No. 596, 10 inches.

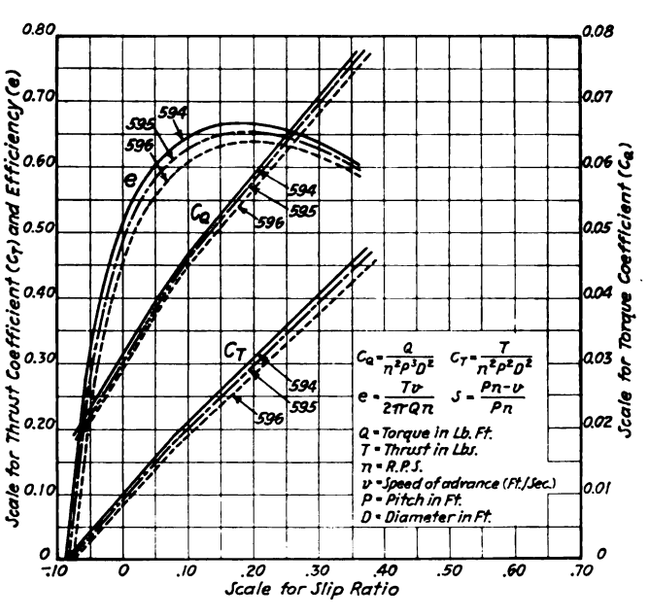

Scale for Thrust Coefficient (C_T) and Efficiency (e)
Scale for Torque Coefficient (C_Q)
Scale for Slip Ratio
$C_Q = \frac{Q}{n^2\rho^5 D^5}$ $C_T = \frac{T}{n^2\rho^2 D^2}$
$e = \frac{Tv}{2\pi Qn}$ $S = \frac{Pn-v}{Pn}$
Q = Torque in Lb.-Ft.
T = Thrust in Lbs.
n = R.P.S.
v = Speed of advance (Ft./Sec.)
P = Pitch in Ft.
D = Diameter in Ft.
594
595
596

Fig. 3.—Characteristic curves for propellers Nos. 594, 595 and 596, all set to 6-inch pitch at 2/3 radius

Diameter, 8 inches. Designed pitch for No. 594, 6 inches; for No. 595 8 inches; for No. 596, 10 inches.

Generated on 2024-09-12 14:17 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

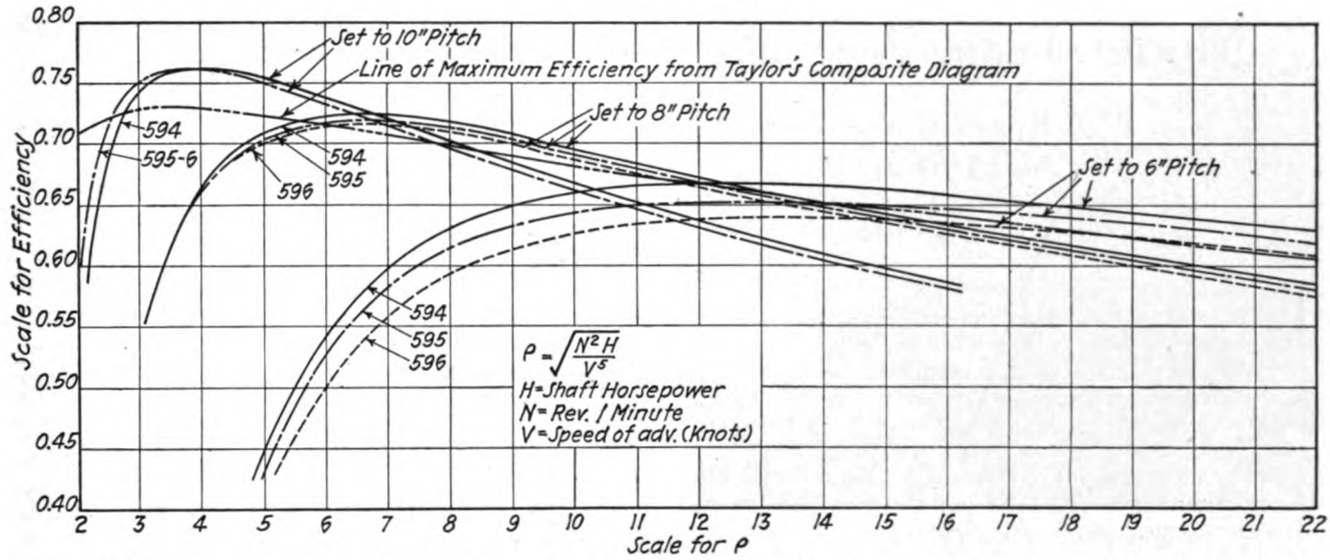


Fig. 4.—Efficiency —ρ curves for propellers Nos. 594, 595 and 596 set to 6-, 8- and 10-inch pitch, respectively. Diameter, 8 inches

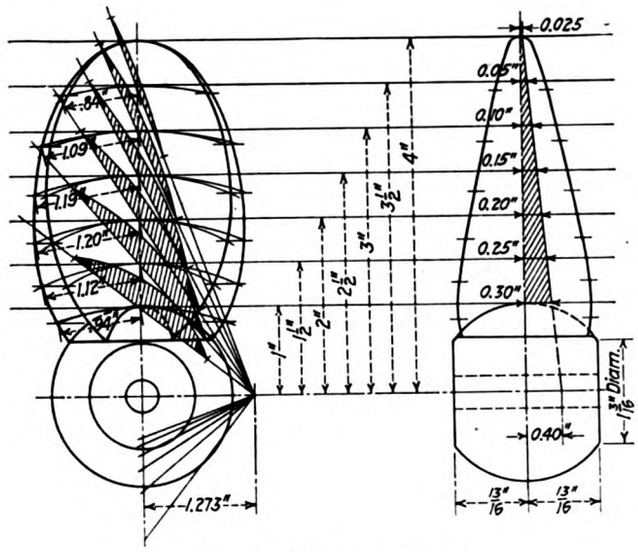


Fig. 5.—Propeller No. 595

efficiency runs about two points higher than that from Taylor's chart. The diagrams are self-explanatory.

The following general conclusions can be drawn from these tests:

1. That if an adjustment in pitch after the vessel is in service is anticipated the designed pitch of the propeller should be on the low side, so that the blade will have to be turned up rather than down.

2. That for moderate changes in pitch the resulting efficiency and revolutions can be closely approximated by assuming the propeller to have a constant pitch equal to that at two-thirds the radius.

Diesel-Electric Ferry Boats in New Service on West Coast

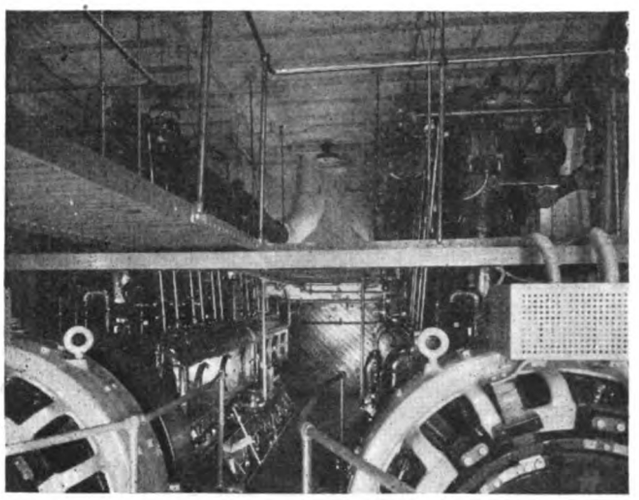
INAUGURATION by the Golden Gate Ferry Company of ferry service between San Francisco and Berkeley fulfills a long felt want not only because it provides direct transportation to Berkeley but also because the new route enters San Francisco at the foot of Hyde street, relieving Market street of much traffic. That there was a real demand for the service is shown by the fact that it went on a paying basis from the start and after the first few weeks of operation it became apparent that additional equipment would be needed to handle the growing traffic, and an order was placed for another boat.

The Golden Gate Ferry Company, under direction of President A. O. Stewart, has operated boats between San Francisco and Sausalito for 5 years. Experience gained in that service was helpful in determining the type of boats most applicable to the new run. Three new vessels, the *Golden Bear, Golden Poppy,* and *Golden Shore,* were built, all being completed and placed in commission between June 1 and July 1. They are identical in size and construction, being of the latest design of wooden hull types. They were built by the General Engineering Company of Alameda, Calif. During the entire year, each boat will be operated on 24-hour service one-third of the time and on 14-hour service the balance of the time.

The boats are of Diesel-electric drive. Each is fitted with three Ingersoll-Rand "PR" type, 14 by 19-inch, 6-cylinder, 400-horsepower engines directly connected to Westinghouse generators and exciters, which convert the power to electric energy for driving the propulsion motor. The boats are equipped with pilot house control. They are noiseless and free from vibration. The fourth unit, which is now under construction, is to be similar in all respects to the three now in service.

Golden Gate ferry boat Golden Poppy

Generated on 2024-09-12 14:20 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Engine room of the Golden Poppy

The engine room auxiliaries have elicited as much comment as the driving mechanism, owing to the convenience and flexibility of operation which they provide. Two electrically-driven Ingersoll-Rand auxiliary compressors, a type 15 and a type 20, are provided. The piping from these machines to the two 3-foot by 9-foot air receivers is so arranged that both compressors can discharge into one receiver until the pressure is built up to 150 pounds. One compressor then automatically stops, while the other continues to operate until the receiver pressure is 300 pounds. With this arrangement, all three driving engines can be started from atmospheric pressure in less than 15 minutes.

As soon as the engines are in operation, the second receiver is charged to 100 pounds pressure and then serves as storage capacity for blowing the whistle. One compressor automatically keeps the pressure within certain limits, starting up when it drops to 60 pounds and cutting off when it reaches 100 pounds.

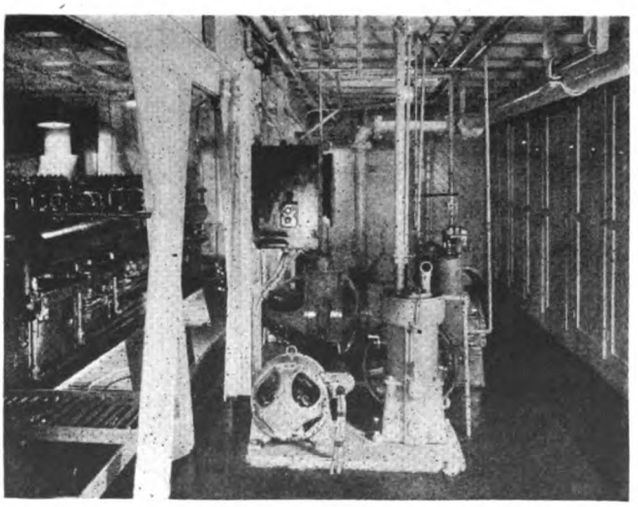
If a boat is taken out of service for any reason, both receivers are charged to 300 pounds of pressure, thereby providing the required starting air for the engines when service is resumed. If these receivers should lose their air supply, emergency power for the compressors is available from a small auxiliary generating set.

The lubricating system also has proved unusually satisfactory. Oil from the base of the engine is pumped through an oil strainer, then through oil coolers and back to the engine at a pressure of about 25 pounds.

The circulating water pump has sufficient capacity to handle the water on all three engines. A duplicate unit is installed for standby service.

An electric heater is provided for use when fuel oil of low gravity is used. So far, the engines have burned oil of 27 degrees Baumé gravity and there has been no occasion to use the heaters.

The three new ferries have been put into service under the supervision of C. C. Brown, chief engineer and assistant general manager of the owning company.



Auxiliary air compressors in engine room of the Golden Poppy

Albert H. Denton Appointed Member of the Shipping Board

ALBERT H. DENTON, of Arkansas City, Kan., who has been appointed by the President as a member of the Shipping Board to succeed W. S. Hill, whose recess appointment was not renewed by the President, appeared before the Senate Commerce Committee for questioning on December 20 and the committee shortly afterward voted in favor of a confirmation of his nomination by the Senate. The Senate, however, adjourned on December 21 as soon as it was convened, because of the death of Senator Jones of New Mexico, so that action on the confirmation was postponed until after the holiday recess. Mr. Denton is a farmer and banker and was chosen by the President because of his financial experience. He will succeed to Mr. Hill's duties as a member of the board in the supervision of financial departments of its work. He was selected also because of the requirement of the law that a member of the board come from the middle west. He has had no experience in shipping matters, although he is an advocate of a strong merchant marine. He was born on a farm in Cowley county, Kan., which he still owns, and had worked his way up from messenger boy to president of the Home National Bank of Arkansas City, one of the largest in southern Kansas. He recently sold his interest in the bank and has been acting as national bank receiver, winding up the affairs of closed banks in Texas and Iowa. Mr. Denton was recommended by leading bankers for a position on the Federal Reserve Board during the Harding administration and was tendered but declined the governorship of the Farm Loan Board.

A. H. Denton

Prof. Besselievre Dies Suddenly

PROFESSOR A. C. BESSELIEVRE, dean of the Webb Institute of Naval Architecture, New York, died on December 28 of pneumonia at the age of 41. Professor Besselievre, after graduating from the Massachusetts Institute of Technology in 1909, was connected with the Lake Torpedo Boat Company, Bridgeport, Conn., the New York Shipbuilding Company, Camden, N. J., and during the war with the government's Delaware River yards. After the war he formed a consulting partnership in Philadelphia with Henry Lysholm and in 1923 went to the Webb Institute.

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

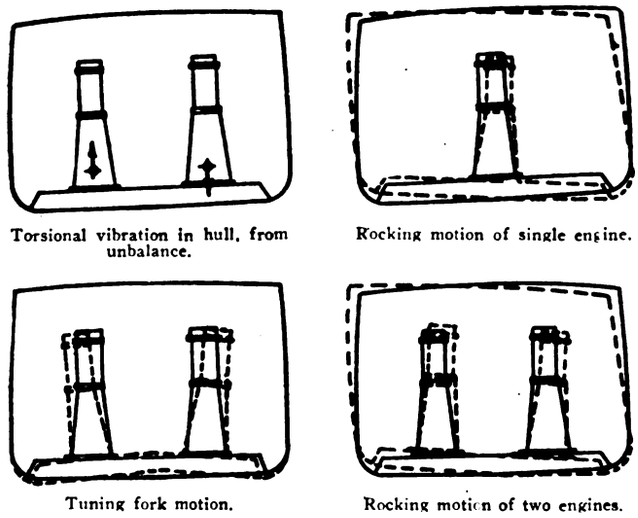
Vibration and Engine Balance in Diesel Ships*

Sources of vibration—Modes of vibration of hull and calculation of natural frequencies—Balance of the Diesel engine—Torque reaction

By Frank M. Lewis†

IN this paper are discussed those special problems of hull vibration and engine balance which arise in Diesel-engined vessels. Diesel engines are excessively noisy, far noisier than the older reciprocating engines and turbines, and noise is only a form of vibration. For a cargo vessel, vibration may be of little consequence provided it is not of sufficient magnitude to damage the hull or machinery; but for any passenger vessel, quiet and the absence of vibration are considerations of the highest importance. The motor yacht is a type of passenger vessel in which, due to the light hull and relatively high power, vibration from the engines has been especially troublesome. It is now time, if the Diesel engine is to maintain its position for passenger vessels, that more attention be given to those refinements of design needed to insure quiet and the absence of vibration.

We wish at the outset to postulate an ideal condition for a motorship as regards vibration and noise. We consider



Torsional vibration in hull, from unbalance. Rocking motion of single engine. Tuning fork motion. Rocking motion of two engines.

Fig. 1

such an ideal condition to be one in which it is impossible to detect, from vibration or noise, except perhaps directly in the engine room, whether or not the machinery is in operation. We believe this goal to be nearly attainable.

It should be self evident that all vibration on a vessel must be generated, fundamentally, by either the engines, auxiliary machinery, or propellers, or be associated in some way with its motion through the water. Strictly speaking, there is no such thing as "hull vibration;" that is, the cause of vibration can never exist in the hull itself.

The amplitude of vibration is determined by two factors: first, the magnitude of the periodic forces the engine exerts upon the hull; second, the hull structure. Both factors are requisites. It is evident that, if engines or propellers exerted no periodic forces upon the hull, it would not vibrate, no matter how weak it were structurally; but it is impossible to build engines entirely free of such forces. It is evident likewise that if a hull could be built infinitely stiff it would not vibrate, but that is an impossibility also.

The manner in which the second factor, the hull, influences the vibration is very complex in character. It is not merely a question of the weakness or strength of the hull or even of its stiffness. The amplitude of vibration is usually fixed by the resonance effect; that is, when the natural frequency of one of the modes of vibration of the hull synchronizes with the frequency of one of the periodic forces of the engine or propeller, the vibration becomes a maximum.

There are three methods of avoiding vibration: Eliminate the periodic force, or cancel it by another equal and opposite force; avoid synchronism between the natural frequency of the periodic force and the vibrating body; increase damping effects.

Only these three general methods are available to eliminate the more complex types of ship vibration. The first of these methods will entirely eliminate vibration; the other methods will only reduce it.

Sources of Vibration in Engine and Propeller

Engine Forces.—The periodic forces of the engine which may cause vibration in the hull can be classified as follows:

(*a*) Forces due to unbalance.
(*b*) Torque reaction moment.
(*c*) Miscellaneous minor forces and noises from valve gear, gearing, exhaust, etc.

In this paper we will discuss only the first two items, balance and torque reaction. The third item is, nevertheless, of very great importance, especially in passenger vessels. It is the sum of these minor effects which determines the noise from the engine; and the Diesel engine is certainly in need of great improvement in this respect. The reduction of noise is a process of refinement, of going over the engine part by part, determining the noise producing factor of that part, and eliminating it. We do not mean that this can be accomplished with existing engines. It means experiment with these engines, and an application of the experience thus gained to future designs.

Propeller Forces.—The vibration causing forces of a propeller are no different in a Diesel ship than in one of any other type. It is doubtful if vibration from the propellers can ever be completely eliminated. When the proper conditions are observed, however, vibration from this source can be made very slight. These conditions are as follows:

(*a*) Proper balance.
(*b*) Equality of pitch between the blades.
(*c*) Conditions assuring a smooth flow to the propeller over the disk area. These conditions are easy lines, so that the stream velocity shall be as nearly uniform as possible and there shall be no eddies; ample clearance between propeller tips and hull, propeller and stern post, struts, etc., or between adjacent propellers.
(*d*) Avoidance of the ringing noise due to vibration between the blade and its hub.

The Modes of Vibration of a Hull

The principal modes of vibration of a ship's hull can be classified as follows:

(*a*) Vertical vibration of 2 or more nodes.
(*b*) Horizontal vibration of 2 or more nodes.

* Abstract of a paper read at the thirty-fifth general meeting of the Society of Naval Architects and Marine Engineers, New York, November 11, 1927.

† Professor of Engineering, Webb Institute of Naval Architecture, New York.

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(*c*) Torsional vibration of 2 or more nodes.
(*d*) Vibrations between engine or engines and hull. There are two types of rocking motions, transverse and longitudinal; and in twin-screw vessels a special type, tuning fork vibration.
(*e*) Miscellaneous local vibrations; their number is legion.

The tuning fork vibration can be eliminated by the old and simple expedient of tying the engines together at the top. We recommend this as good practice in any twin-screw Diesel installation.

It is not to be expected that these connections between the engines will eliminate all vibration generated by the torque reaction. There are many types of local vibrations which are generated by the same force.

The number of local forms of vibration which may exist is innumerable. There may be vertical vibration of a poorly supported deck, vibration of a pilot house or other deck structure, or even vibration of doors, windows or furniture. Such local vibrations will often be more annoying than the principal forms noted before. Local vibrations may be generated by unbalanced forces of engine or propeller, or torque reaction, the greater number of them usually coming from the last source. The vibration is usually a resonance effect. The force of unbalance or torque reaction will cause a slight forced vibration throughout all parts of the hull at all speeds, and this vibration may be magnified in any local part having the proper natural frequency. We may thus have a violent vibration of some local part when a scarcely perceptible vibration exists in the hull between that part and the source of the vibration in the engines or propellers. It would be impossible to determine beforehand all the parts of a ship's structure or fittings which might vibrate. The very number alone would prohibit.

As shown in the discussion of the vibrating rod under a periodic force, there are three methods of eliminating or reducing vibration; Elimination of the periodic forces, avoidance of proximity to the synchronous speeds; increasing damping effect.

The first of these methods is always preferable if it can be applied. Further, it is the only method by which the ideal vibrationless ship can be attained. Elimination of the periodic forces eliminates vibration completely at all speeds. The other methods cannot eliminate vibration; they can only reduce it.

The elimination of the periodic forces arising from the engines necessitates, first, perfect balance; second, reduction of torque reaction effects. With many types of Diesel engines such perfect balance is attainable that it is quite immaterial whether the engine is running in one of the synchronous speeds for the hull or not.

Regarding torque reaction, we are not quite so fortunate, since this can never be entirely eliminated. Certain types of engines are inherently much better in this respect than others. Further, there are methods we will discuss later by which the torque reaction moment can be reduced.

The position of the engine in the hull will influence the vibration. An engine unbalanced for vertical force located at a node will produce but slight vibration, likewise an engine unbalanced for moment located at a loop. But the position of an engine in a hull is fixed by considerations quite apart from vibration, so that a useful method of eliminating vibration does not lie in this direction.

Calculation of the Natural Frequencies of the Nodes of Vibration of the Hull

Vertical or Horizontal Vibration of 2 or More Nodes.—The computation of the natural frequency of a ship's hull offers considerable difficulties. It is possible to compute it with sufficient accuracy for the result to be of practical value only by more or less empirical methods; that is, by comparison with other ships of known frequency.

* T. I. N. A., 1884, 1893, 1894, 1895. Priority subsequently claimed by Normand (see Schlick's paper of 1894).

The most useful as well as simplest formula for this purpose is that proposed by Schlick:*

$$N = \phi \sqrt{\frac{I}{\Delta L^3}}$$

where N = natural frequency in vibrations per minute.
I = least moment of inertia of the midship section in feet.
Δ = displacement in tons.
L = length in feet.
ϕ = a constant depending on type of ship.

Comparison with the equation of the vibrating rod shows that the formula is of the correct dimension.

The constants given by Schlick with a few others are as follows:

For 2-noded vibration

Cargo ship	1,533,000
Tanker	1,610,000
Yacht	1,710,000
Large passenger vessel	1,722,000
Destroyer	1,882,000

For vibration of 3 or more nodes the same form of formula may be used, modifying the constant ϕ. For a free uniform bar the natural frequencies will be in the following ratio to the 2-noded frequency:

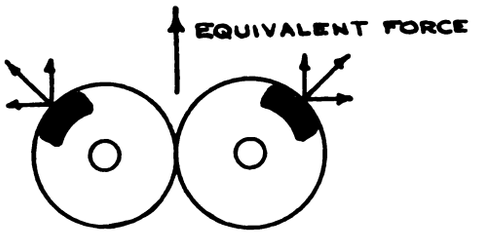


Fig. 2

3-node: $4.99^2/3.01^2$ 4-node: $7^2/3.01^2$ 5 node: $9^2/3.01^2$, etc.

and the constant ϕ may be multiplied by these ratios. The result cannot be expected to be more than a rough approximation.

For vessels of ordinary structure and load distribution it is probable that Schlick's formula will predict the natural frequency with as much accuracy as can be obtained by any other method. The chief sources of error in its use will lie in choosing the proper value of ϕ and in the calculation of I. The difficulty of calculating I lies in judging which of the hull members contribute to the longitudinal stiffness.

On the Balance of the Diesel Engine

A general discussion of engine balance is outside the scope of this paper.† We will assume the reader's familiarity with the fundamental principles and consider only the balance of certain specific types of Diesel engines.

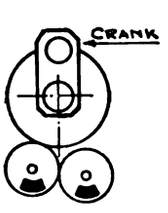


Fig. 3

The force in the line of centers given by a reciprocating mass of a crank connecting rod ratio of 4.5 is given by the equation:

$$P = \frac{W\omega^2 r}{g}(\cos\theta + .225\cos 2\theta + .0028\cos 4\theta + .000040\cos 6\theta + \ldots) \quad (30)$$

It will be seen that after the second term the forces are small.

†See Taylor: 'The Theoretic and Practical Methods of Balancing Marine Engines." Soc. of N. A. & M. E., 1901. Dalby: "The Balancing of Engines." Judge: "Automobile and Aircraft Engines."

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

We will define a completely balanced engine as one in which the forces represented by the first two terms cancel. This will represent a degree of balance sufficiently complete for practically all engines, but it should be borne in mind that in an engine so balanced there may still exist small forces of the fourth or higher orders. There may also exist rocking moments from the angular acceleration of the rod, but in nearly all types these moments cancel between the various cylinders, and in those types in which they do not cancel these moments will be small in comparison with the torque reaction moment.

There are certain methods and devices for obtaining balance which it will be of interest to discuss first.

Crankshaft counterweights.—A counterweight fixed to the crankshaft will completely balance only a rotating mass. Nevertheless a shaft counterweight may often be used with advantage to balance a reciprocating mass. If a counterweight, having a moment equal to that of the reciprocating mass, is affixed to the shaft, the vertical primary force will balance and there will result a horizontal unbalanced force equal to the previous vertical. In many cases this would be an advantage, for a horizontal force would cause less vibration than an equal vertical.

As is evident from Fig. 2, two oppositely rotating counterweights, geared together, will supply a one directional periodic force. By gearing them in proper speed relation to the shaft, the force may be made of any frequency. This is a very useful device, especially valuable for balancing second or higher order forces. It is the principle of the well known Lanchester balancer, Fig. 3, used for balancing the

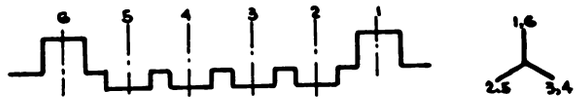


Fig. 4.—6 cylinder, 4 cycle crank shaft

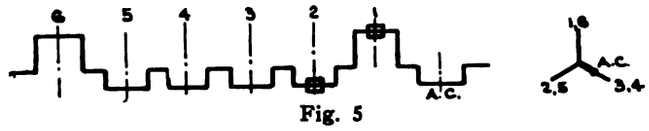


Fig. 5

second order forces in several 4-cylinder 4-cycle motor car engines.

Any engine could, in theory at least, be completely balanced by the use of such geared counterweights, of proper moment, speed and phase relation to the shaft.

The 6-Cylinder 4-Cycle Engine with Single Crank Compressor.—We will discuss this engine more fully than the other types as the treatment of several of these is similar.

With the crank arrangement shown in Fig. 4, the engine is completely balanced, except as to the air compressor. The air compressor gives a vertical and horizontal primary, and vertical secondary, unbalanced force. It may be questioned by some whether the unbalanced forces of this air compressor alone would be sufficient to cause any vibration in the hull. Our experience has been that they can, and that under conditions of synchronism with the hull frequency the vibration can be very severe. We therefore consider means of obtaining balance.

The air compressor may be partially balanced by a fixed counterweight attached to the shaft. A method often used is to counterweight the rotating part and half the reciprocating weight. This is usually incorrect. The counterweight should be just sufficient either to balance the rotating part, which will eliminate all horizontal force, or balance both the rotating and reciprocating parts, which will eliminate the primary vertical force. The first procedure should be used if the engine is to run near the horizontal natural frequency of the hull, and the second if it is to run near the torsional or vertical frequency. The latter condition is usually the case. Whichever counterweight is fitted, there will remain a horizontal or vertical primary force and a vertical secondary force and consequently some vibration in the hull, although it may be slight. For any purposes such a balance would be entirely satisfactory.

A second method of partial balance would be as follows. The rotative part is assumed balanced by a shaft counterweight. Consider Fig. 5. The air compressor crank has been set in line with number 3 crank and the crank connecting rod ratio of the main and air compressor cylinders is made equal. Piston counterweights, having a moment equal to the reciprocating part of the air compressor, are then applied to numbers 1 and 2 pistons. The air compressor and the counterweights on numbers 1 and 2 cylinders constitute a 3-crank engine. There will then remain unbalanced only small primary and secondary moments. The primary moment may be converted into a horizontal moment by fixed counterweights of opposite phase, at each end of the shaft. This balance is superior to that of the first method.

The 6-cylinder 4-cycle engine may be completely balanced for all forces by a system of properly weighted pistons. Rotating parts are balanced by a shaft counterweight on the compressor.

Other 4-Cycle Engines.—Because of the large torque reaction variation, 4-cycle single acting engines of 4 or 5 cylinders are hardly suitable for any vessel in connection with which vibration is an important consideration. We will therefore not consider their balance in detail. The 4-cylinder engine could best be balanced by the use of geared counterweights, similar to the Lanchester balancer. 5 and 7-cylinder 4-cycle engines are uncommon; their balance is similar to that of 2-cycle 5- and 7-cylinder engines which we will discuss later.

Two-Cycle Engines.—The general design of 2-cycle engines is in an even less standardized state than is that of the 4-cycle. Of particular interest to this paper is the arrangement of air compressors and scavenging pumps. The mode of attachment of these parts differs in almost every make of engine. They may be driven from cranks on the shaft attached at either end, both ends or center, by rocking levers attached in various ways, by connecting rods attached to the main rods, or be independently driven. We will consider only the balance of the crank shaft and main pistons, assuming that the pumps are independently driven, and indicate in a few cases how a cranked pump attached at one end may be balanced in.

With 2-cycle engines we usually have a multiplicity of crank arrangements from which to choose. Let there be n cylinders. Then the number of possible crank arrangements is $\lfloor\overline{n-1}/2$. The choice of the proper crank arrangement will often be of great assistance in balancing. The choice of crank arrangement also influences to a certain extent the minor torsional critical speeds of the engine.

Six-Cylinder 2-Cycle Engine.—The possible number of firing orders is $\lfloor\overline{5}/2 = 60$. Of these the four firing orders 1, 2, 4, 6, 5, 3—1, 5, 4, 6, 2, 3—1, 2, 3, 6, 5, 4 and 1, 5, 3, 6, 2, 4 are completely balanced except as to primary moment, and the firing order 1, 4, 5, 2, 3, 6 is completely balanced except as to secondary movement. Of the first four firing orders, 1, 5, 3, 6, 2, 4 is the best, having not only a smaller unbalanced moment but not requiring the firing of successive cylinders in sequence. To obtain balance equal and opposite forces must be applied at each end.

Fig. 6 gives the end view of an engine; the crank shaft and cam shaft are assumed to be turning oppositely. The rotative moment is balanced by shaft counterweights at each end.

Eight-Cylinder 2-Cycle Engine.—The possible number

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

of crank arrangements is $\underline{|7/2} = 2{,}520$. From these 2,520 arrangements we may select, by the following method, those in which the secondary moment balances. Fig. 7 gives the direction of the cranks for the primary and secondary moment of the firing order 1, 8, 2, 6, 4, 5, 3, 7. For the secondary moment to balance, the moments in the 2 planes

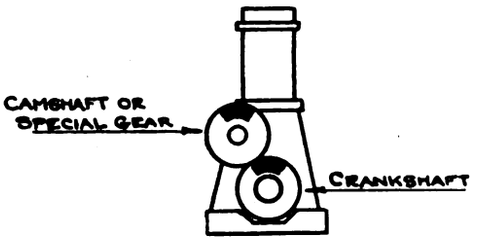


Fig. 6

must balance independently. With the firing order shown it is evident that the secondary moment balances since $1 + 4 = 2 + 3$ and $6 + 7 = 8 + 5$. By trial it will be found that there are possible six such sets of numbers; they are:

1st group.	*2d group*
1, 4 — 2, 3	5, 8 — 6, 7
1, 6 — 2, 5	4, 7 — 8, 3
1, 7 — 3, 5	2, 8 — 4, 6
1, 8 — 2, 7	3, 6 — 4, 5
1, 8 — 3, 6	2, 7 — 4, 5
1, 8 — 4, 5	2, 7 — 3, 6

In each line each group of numbers represents 4 cranks at right angles to each other (see Fig. 8). These two groups

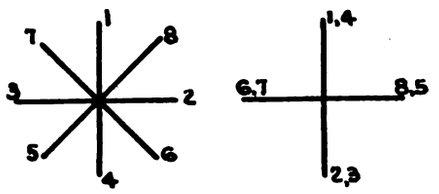


Fig. 7

of 4 cranks may be arranged in eight different ways with respect to each other. Therefore, there will be altogether $8 \times 6 = 48$ different crank arrangements which are completely balanced except as to primary moment. We have listed these forty-eight arrangements and calculated the unbalanced primary moments of each. The following are selected as being of special interest:

No.	*Firing order*	*Unbalanced moment*
6	1 8 2 6 4 5 3 7	.446 *Wa*
15	1 8 2 4 6 3 5 7	1.71 *Wa*
42	1 6 4 2 8 3 5 7	2.76 *Wa*

The first arrangement has the smallest unbalanced force of the entire 2,520 possible arrangements. The unbalanced

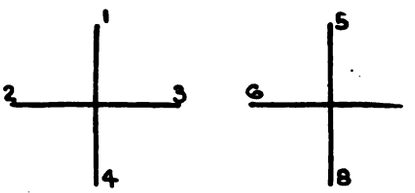


Fig. 8

primary moment is very small. The only defect is the firing of 4 and 5 in succession. With cranks that are in two pieces with a longer bearing between 4 and 5 this would be of little consequence.

Five-Cylinder 2-Cycle Engine.—There are 12 possible crank arrangements. The balance of this engine offers considerable difficulties. Partial balance may be obtained in various ways. We have not as yet devised any method of obtaining complete balance which we can consider wholly satisfactory. The method will completely balance the engine but involves the use of geared counterweights at each end, running at twice engine speed.

The Four-Cylinder 2-Cycle Engine.—To obtain a satisfactory balance with this engine in the large sizes in which it is usually built is a practical impossibility. A fair balance might be obtained by the use of the Yarrow, Schlick, Tweedy system of steam engine balance, but at the expense of considerable increase in piston weights and increased difficulties from torsional vibration in the shafting.

We therefore consider the use of this engine inadvisable for any vessel in connection with which freedom from vibration is an important consideration.

Seven-Cylinder 2-Cycle Engine.—There are 360 ways in which the crank shaft may be arranged. We have computed the unbalanced primary and secondary moments of each. Of these, the firing order we consider most satisfactory is 1, 5, 2, 4, 6, 3, 7. The secondary moment with this arrangement practically balances. There is a moderate unbalanced primary moment. By the use of a shaft counterweight at each end the primary moment may be converted into a horizontal moment or by the use of shaft and cam shaft counterweights the engine may be completely balanced, as explained for the 6-cylinder engine.

On Torque Reaction

In a previous paper we have discussed the torque which a Diesel engine exerts upon its shaft.‡ The torque reaction of the engine frame upon the ship is exactly equal, but opposite in direction.

The torque may be divided into two parts, that arising from gas pressure and that arising from inertia forces. We have found the easiest and quickest method of treatment to be to consider the typical turning effort curve of a single cylinder, to analyze this into its harmonic components, and from these harmonic components to build up the turning effort curve of any type of engine.

The harmonic components for a single-acting engine or

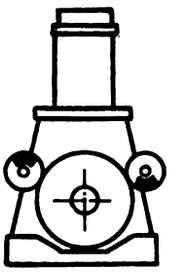


Fig. 9.—Torque reaction balancer

for the upper end of a double-acting engine may be taken from the previous paper. It should be noted, however, that the cosine gas pressure components as given there were incorrect in sign; the positive components should have been negative and the negative components positive.

It has been proposed to hold the engines in step by a differential governor device. We doubt if it would be possible to do this. Even if possible, it would not be desirable, since in making a turn the inboard engine would be greatly overloaded.

It has been proposed, in place of mechanical gearing, to use electrical connections. Suppose we have two 6-cylinder 4-cycle engines. Let us mount on each shaft a 6-pole synchronous motor in proper phase to the engine and interconnect these motors. If of sufficient power, these will hold

‡ S. N. A. & M. E. 1925.

Generated on 2024-09-12 14:23 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the engines in step. If one engine develops more power than the other, the excess will be carried through the cross connection from one motor to the other. Aside from the expense, the greatest difficulty with this arrangement seems to be that, in turning, the inboard screw develops power greatly in excess of the outboard, so that if the engines are to keep in step while the ship is turning the motors would need to be of considerable power.

Consider Fig. 9. Assume we have a 6-cylinder 4-cycle engine. We place at each side of the engine a rotating counterweight, driven at three times engine speed, the two weights being 180 degrees in phase to each other. Driven by the engine, the counterweights will supply a third order

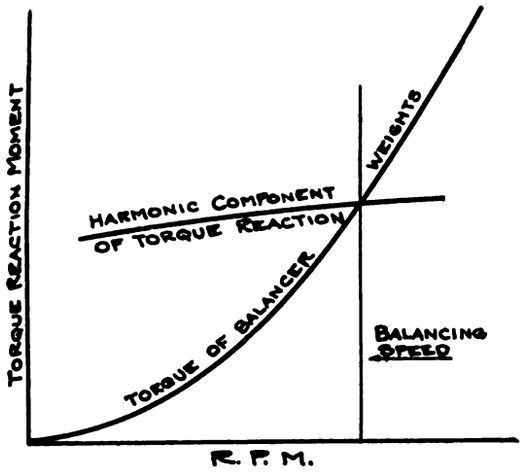


Fig. 10

torque reaction varying as the square of the speed. The graph of this as a function of the revolutions per minute is given in Fig. 10, also the graph of the third order cylinder torque component. It is evident that by the use of a pair of such counterweights of proper moment and set to proper phase relation to the shaft, the third order component of the torque reaction, which is the largest component, may be cancelled at any particular speed and will be greatly reduced at all other speeds.

As a result of the torsional vibration in the engine, we thus have two sets of forces upon the engine frame, tending to cause vibration—a vertical force and a torque reaction—both of the frequency of the torsional vibration. Since torsional vibration in an engine can never be entirely eliminated, these forces will always be present to a certain extent; but, provided there are no serious torsional criticals present, the vibration should be inappreciable. We have assumed throughout that no serious torsional criticals were present in the engine and have therefore not considered these as a source of hull vibration. If any are present, the danger to the shafting is a matter of much greater importance than the external vibration in the hull.

Trial Trip of the Motor Liner Augustus

By Our Special London Correspondent

PARTICULARS and machinery plans of the motor passenger liner *Augustus* have already been published, but a few details may be given concerning the trials of this important ship, which has just been placed on her regular service between Genoa and Buenos Aires. It may be recalled that she is the largest oil engined ship built or under construction, her gross tonnage being 32,650, while the machinery power is 25,000 shaft horsepower with a maximum of 28,000 shaft horsepower.

The *Augustus* is owned by the Navigazione Generale Italiana, Genoa, was built by the Ansaldo Company at Sestri Ponente, near Genoa, and engined by the M.A.N. and their Italian licensees, the Savoia Company. Her trial trip speed was a little uncertain, but it was found that she attained practically 20 knots, which was about what had been anticipated. In service, however, it is intended to operate at 19 knots, which represented, according to trial trip data, an output of almost exactly 25,000 shaft horsepower on the four propellers, when running at 120 revolutions per minute. It is stipulated that, for a whole day, each engine can run up to 7,000 shaft horsepower, making a total of 28,000 shaft horsepower and on trials the maximum power actually developed was 28,800 shaft horsepower.

The machinery represents the first installation of double acting, two stroke engines in a big liner, since most of the other large motor liners that have been built, including the *Saturnia, Asturias, Alcantara, Carnarvon Castle* and *Gripsholm,* have been equipped with double acting, four stroke engines. The performance of the machinery of the *Augustus* on trials and on her maiden voyage, is said to have been completely satisfactory, and marked by an absence of vibration. It is understood that the re-engining of the North German Lloyd liner *Columbus,* following on the accident to one of the steam engines, is being considered and that possibly Diesel motors of the M.A.N. type will be installed. The power required will be somewhat in excess of that of the *Augustus* and representatives of Blohm & Voss, the German firm which builds M.A.N. double acting, two stroke machinery, were present on the occasion of the trials of the new liner, in order to ascertain the performance of the motors.

As befits the largest passenger liner trading to Buenos Aires, the *Augustus* is equipped in luxurious not to say lavish style. Her open air swimming bath on the top deck is a novelty and the builders have endeavored to create the idea of a miniature Lido. The *Augustus* is said to be the only vessel equipped in this manner. The main dining saloon, about 20 feet high, is on an upper deck and not below as is customary in most liners, while there is a secondary rest room or tea room almost as large, with red lacquer furniture and panelling, giving an altogether remarkable effect. The usual smoking room, reading and writing room and other public saloons are provided, together with the winter garden—a very necessary feature on all ships which cater to Argentinians. Not only is there the swimming bath mentioned on what is termed the sports deck, but space is provided for a large tennis court. It is interesting also to record that on the *Cap Arcona,* the Hamburg South Amerika Line 27,000-ton steam driven liner which has just been built for South American service, a sports deck on somewhat similar lines is also provided, although in this vessel the swimming bath is at the bottom of the ship.

Arico Grinding Compound

THE American Hammered Piston Ring Company, Baltimore, Md., has placed on the market a grinding compound, known as Arico, which is designed for simultaneous grinding and polishing, heavy pressure being used for cutting and a lighter one for finish-polishing. This compound is especially recommended for use on valves, giving them a smooth and velvet finish on the seat. The seat is easily cleaned after the job by water or gasoline. Arico is a water mixed compound and is sold through jobbers in one-quarter and one pound tins, and also in small utility tubes like tooth paste. It is claimed that this is the first time it has ever been possible to use a tube for grinding compound.

Generated on 2024-09-12 14:41 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Submarine of Today*

Offensive and Defensive Submarines

By Lawrence Y. Spear

WHEN the development of the submarine of today began, the distinguishing quality, namely, the ability to operate submerged, was confined to vessels of small displacement, low speed, limited radius of action and sea-keeping qualities, with no other armament than torpedoes. This class of vessel, strictly limited in its military role to harbor defense, was accurately described as a "defensive submarine torpedo boat." The engineering progress of a single generation has enabled the naval architect to apply the submerging principle to sea-going ships of large displacement, high speed and long radius of action, and to add to the armament by the introduction of the gun and the mine, with the result that, both from the point of view of strategy and tactics, the submersible vessel is no longer confined to the defensive role, but has also taken its place as an offensive weapon of peculiar and extraordinary value.

With a very few unimportant exceptions, no submarines of less than 350 tons surface displacement are now in commission in the navies of the world and, bearing in mind the fact that a boat of this displacement may have a radius of action of 3,000 to 4,000 nautical miles, a mere glance at the map of the world is sufficient to demonstrate the possibility of the use on the "offensive" of a very large proportion of existing submarines. So far as the great naval powers are concerned, the lower limit of displacement is rapidly moving upward, as the present building programs show surface displacements ranging from 600 to 3,000 tons. The minimum displacement necessary for the highest efficiency for coast defense therefore is adequate in many cases for an offensive role.

*Abstract of a paper read at the thirty-fifth general meeting of the Society of Naval Architects and Marine Engineers, New York, November 10, 1927.

The vessels discussed in this paper are classified as follows:

Class A.—The submarine torpedo boat proper, including all vessels of which the primary rôle is torpedo attack on surface warships, notwithstanding the fact that the armament also includes guns.

Class B.—The submarine cruiser, including all vessels whose primary rôle is commerce destruction on the high seas and long-distance scouting. Here, also, the armament includes both torpedoes and guns, which should probably be considered to be of about equal importance.

Class C.—The mine-laying submarine, including all vessels whose primary rôle is mine-laying. In the general case, the armament will also include torpedoes and guns.

The above classification does not include certain special types such as the "monitor submarine" and the "anti-submarine submarine."

TABLE 1

Design No.	1	2	3	4	5	6	7
Constructed or designed for	Russia	Holland	Great Britain, Italy, Russia, Chile, U. S.	Norway	Holland, Spain	Peru	Russia
Surface displacement	35	190	360	425	557	590	665
Single or double hull	S.H.	S.H.	S.H.	D.H.	D.H.	S.H.	D.H.
Depth test	150 ft.	150 ft.	200 ft.	165 ft.	130 ft.	200 ft.	150 ft.
Power surface	50 H.P.	350 H.P.	480 H.P.	900 H.P.	1,400 H.P.	880 H.P.	1,700 H.P.
Surface speed	9 K	12.25 K	13 K	15 K	16 K	14.5 K	16 K
Submerged speed	7.75 K	9.5 K	11 K	11 K	10 K	9.85 K.	12 K
Cruising radius, normal	300	950	2,600	2,000	4,500	4,500	3,000
Percentage of buoyancy	23%	18.5%	20%	24.5%	25%	15.7%	34%
Cruising radius, maximum	.....	.....	.....	.....	7,300	9,000	8,700
Percentage of buoyancy	.....	.....	.....	.....	18.7%	10%	19%
No. of torpedo tubes:							
Bow	2	2	4	2	2	4	2
Stern	.....	1	.....	2	2	.....	2
Deck	.....	.....	.....	.....	.....	.....	4
No. and size of torpedoes	2—18"	5—18"	8—18"	6—18"	8—18"	8—21"	12—18"
No. and caliber of guns	.....	.....	.....	1—3"	1—3"	1—3"	.....

Design No.	8	9	10	11	12	13	14	15
Constructed or designed for	Spain	U. S.	U. S.	Brazil	France	V1-3 U. S.		
Surface displacement	915	965	1,140	1,315	1,500	2,186	2,400	3,100
Single or double hull	D.H.	S.H.	D.H.	D.H.	D.H.	D.H.	D.H.	D.H.
Depth test	265 ft.	200 ft.	150 ft.	295 ft.	265 ft.	200 ft.	300 ft.	300 ft.
Power surface	2,400 H.P.	1,200 H.P.	4,400 H.P.	3,000 H.P.	4,000	6,000	8,500	11,000
Surface speed	17.5 K	14 K	20.65 K	18 K	19 K	18 K	22 K	23 K
Submerged speed	8.75 K	10 K	11 K	9.5 K	10 K	9 K	9 K	9.5 K
Cruising radius, normal	5,000	4,700	7,000	7,700	8,500	.....	6,000	6,500
Percentage of buoyancy	24%	16.9%	29%	30%	20%	.....	30%	30%
Cruising radius, maximum	12,000	6,000	12,000	13,200	13,200	.....	18,000	20,000
Percentage of buoyancy	10%	14.2%	20%	20%	11%	.....	15%	16%
No. of torpedo tubes:								
Bow	4	4	4	4	4	4	4	4
Stern	2	.....	.....	2	2	2	2	2
Deck	.....	.....	4	.....	4	.....	.....	4
No. and size of torpedoes	14—21"	12—21"	12—18"	16—21"	24—21"	21"	24—21"	32—21"
No. and caliber of guns	1—4" 1—1½"	1—4"	1—4"	1—4" 4—½"	2—4" 2—½"	1—5"	1—5" 4—½"	1—5" 4—½"

Class A—The Submarine Torpedo Boat Proper

The wide range of characteristics embraced in this class is shown by Table 1. With the submarine torpedo boat proper, the direct benefits of increases over a moderate displacement are substantially confined in practice to increased surface speed and radius of action. From the data in Table 1 it might be inferred that nothing substantial in the tactical sense is either gained or lost in passing from moderate to maximum displacements. Such a conclusion would, however, be erroneous, since, once battle contact with the enemy is established, a distinct advantage lies with the smaller vessel on account of its superior maneuvering qualities and the smaller depth of water required for operation.

In order to illustrate more clearly the intimate relation existing between displacement and surface speed and radius, Table 2 has been compiled, in which the constants are the

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

safe depth of submergence, the submerged speed and radius, the surface buoyancy expressed as a percentage of the surface displacement and the percentages of surface displacement reserved for armament and fuel and lubricating oil, the variables being thus confined to displacement, Diesel-engine power, surface speed and surface cruising radius at 11 knots speed. Section 1 of the table is based on the assumption of a twin-screw installation with a single Diesel-engine unit on each shaft, and consequently the designs become impracticable as soon as the total Diesel-engine power required exceeds twice the power available in single Diesel-engine units of proven reliability. Taking 3,000 horsepower as the present-day limit for the engine unit, it follows that when a total of more than 6,000 horsepower is required, the twin-screw installation must be abandoned or some special machinery arrangement adopted, such, for instance, as the semi-electric drive, which will permit of an increase in the number of engine units. These special machinery arrangements are never so economical in space and weight as the simple twin-screw single-engine arrangement, a fact which, of course, again increases the demand of speed upon displacement. To illustrate this point, a second section has been added to the table, containing data with regard to practical designs with twin-screw installations and semi-electric drive.

TABLE 2.—SUBMARINE TORPEDO BOATS

Depth test, 300 feet. Buoyancy normal, 30 percent. Buoyancy with maximum fuel, 15 percent. Maximum submerged speed 9½ knots. Weight of normal fuel and lubricating oil, 6 percent of surface displacement. Weight of armament, 5 percent of surface displacement.

	Section 1					Section 2		
Surface displacement, tons	1,000	1,500	2,000	2,500	3,000	2,000	2,500	3,000
Total B. H. P. engines	2,460	4,480	6,700	9,000	11,800	5,700	7,100	10,000
Surface speed, knots, max.	17.5	19.8	21.5	22.7	23.8	19.8	20.3	22.2
Normal cruising radius at 11 knots, naut. miles	4,000	4,500	5,000	5,500	6,000	5,000	5,500	6,000
Maximum cruising radius at 11 knots, naut. miles	10,900	12,500	13,900	15,000	16,000	13,900	15,000	16,000

Table 2 clearly reveals the high price in displacement, namely, approximately 1,000 tons, which must be paid for the last 2½ knots of surface speed when the latter is accompanied by an increase in the maximum cruising radius at 11 knots of 2,100 nautical miles. Practical experience with submarines of more than 17 knots surface speed is now limited to the British Navy ("K" Class and "X-1") and to the U. S. Navy ("T-1/3" and "V-1/3"). So far as the author has been able to ascertain, no final conclusion has as yet been reached by either the American or British Navy with respect to the minimum acceptable speed for the fast submarine torpedo boat. With full appreciation of the hazards of prophecy, the author ventures the opinion that the different solutions of this problem, if not affected by treaty provisions, may range from a minimum of 18 knots to a maximum of 23 knots with a corresponding approximate variation in displacement of from 1,800 to 3,000 tons.

CLASS B—THE SUBMARINE CRUISER

This newcomer in the submarine field, dating back only to the World War, first appeared in the German Navy, which, during the war, in addition to converting seven merchant submarines into cruisers, laid down forty new cruisers, of which, however, only three were completed and commissioned. The best available information as to the characteristics of the cruisers completed is given in Table 3, which also includes, for purpose of comparison, the characteristics of a contemporary German submarine torpedo boat proper of the so-called "M" type (U-93/98).

TABLE 3

	Cruisers U-138-141	Torpedo boats U-93-98
Length overall	301' 10"	234' 9"
Displacement, surface	1,930 tons	800 tons
Total B. H. P. engines	3,500	2,400
Surface speed	15.8 knots	16 knots
Maximum cruising radius, nautical miles	20,000	5,500
Maximum, submerged speed	7.6 knots	8.6 knots
Depth test	246 feet	.....
No. of torpedo tubes	6	6
No. and size of torpedoes	19—50 cm.	10—50 cm.
Guns	2—15 cm.	1—10.5 cm. 1— 8.8 cm.

While the cruiser involves an increase of 141 percent in displacement as compared with the torpedo boat proper, the number of torpedo tubes and size of torpedoes is the same, and the speeds, both surface and submerged, are reduced, the latter quite materially. Since the actual increase in displacement is considerably in excess of that required to carry the increased weight of armament, ammunition, fuel and stores, it is probable that the cruiser was given greater hull strength, and it may well also be that some further increase in displacement was required to secure stability.

So far as the writer is aware, no post-war constructions of the pure cruiser type have as yet been completed, and only two, U. S. Submarines *V*-5 and *V*-6, are known to be under construction. Data already published, but not authenticated by the Navy Department, indicate that these

TABLE 4—MINE-LAYING SUBMARINES

SECTION 1—GERMAN BOATS

Type	C-1	C-2	C-3	U-71	U-117
No. of boats	15	64	39	10	10
Surface displacement, tons	168	420	480	750	1,160
Engine B. H. P., total	90	500	600	900	2,400
Surface speed, knots	6.4	11.6	12	10.6	14.7
Submerged speed, knots	5.5	6.9	7.2	8	7.1
Cruising radius	850 at 5	.....	.....	4,600 at 7	6,000 at 8
No. of mine tubes	6	6	6	2	2
No. of mines	12	18	14	36	42 and 48
No. of torpedo tubes	0	3	3	2	4
No. and size torpedoes	0	7—50 cm.	7—50 cm.	4—50 cm.	12—50 cm.
No. and caliber of guns	1 M.G.	1 8.8 cm.	1 10.5 cm.	1 10.5 cm.	1 15 cm.
Mine system	Wet	Wet	Wet	Dry	Dry

SECTION 2

Type	U. S. *V-4	Great Britain L-14-17-25	Finland	France: Pierre Chailley	France: Maurice Callot	Italy: Ettore Fieramosca	Italy: X2-X3
No. of boats	1	3	1	1	1	1	2
Surface displacement, tons	2,890	890	400	886	932	1,400	403
Engine B. H. P., total	.....	2,400	800	1,800	2,900	.....	660
Surface speed, knots	17	17	13.5	14	16.5	.....	9.2
Submerged speed, knots	.....	10	8	9	10.5	.....	6.3
Cruising radius	.....	.....	1,500 at 10	2,800	2,800	.....	1,360 at 6.5
No. of mine tubes	.....	.....	.....	.....	.....	2	.....
No. of mines	60	16	18	64	27	.....	18
No. of torpedo tubes	4	4	3	4	6	6	.....
No. and size torpedoes	21"	21"	21"	18"	18"	21"	.....
No. and caliber of guns	1—6"	1—4"	1—3"	1—3.9"	1—14 pdr	1—4.7"	1—14 pdr.
Mine system	Dry	Wet	Wet	Wet	Wet	Dry	Wet

* Data as given by Jane's Fighting Ships.

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

boats have a surface displacement of approximately 2,800 to 2,900 tons, a surface speed of 16 to 18 knots, and carry six torpedo tubes and two 6-inch guns. If the above information is substantially correct it is clear that these boats must be able to carry sufficient fuel and lubricating oil, stores, ammunition and torpedoes to enable them to operate at very long distances from their base and for very long periods of time.

CLASS C—THE MINE-LAYING SUBMARINE

During the World War the German Navy introduced and made extensive use of the mine-laying submarine. Section 1 of Table 4 gives the numbers and characteristics of the German boats actually completed and commissioned, while Section 2 gives published data regarding the numbers and characteristics of vessels of this type built or building for other navies. Mine-laying ability is gained primarily at the expense of the surface speed and radius, and secondarily at the expense of the submerged speed and radius, the sacrifice in neither case, however, being sufficient to destroy the value of the unit for torpedo boat or cruiser purposes.

SPECIAL TYPES

Mention has been made of two special types, namely, the "monitor" submarine and the "anti-submarine" submarine. Both of these types are war-engendered products of British design, as is also the high-speed steam-driven submarine torpedo boat proper. Particulars of these three interesting types will be found in Table 5.

TABLE 5.—SPECIAL TYPES

	Monitor British M Class	Anti-submarine British R Class	High-speed British K Class
Surface displacement, tons	1,600	420	2,140
Total B. H. P. engines	2,400	240	*10,000–12,000
Surface speed, knots	15	9.5	22–23
Submerged speed, knots	9	14	8.5
No. and size torpedo tubes	4—18"	6—18"	10—21"
Guns, number and caliber	1—12" 1—3" 1—m.c.	0	3—4" 2—m.c

* Steam turbines.

The war demonstrated that the allied submarines proved to be the most efficient of all the types of craft, including air craft, which were employed in the campaign against the German submarine. This fact led to the laying down of the British "R" class. The very high submerged speed required for this service was obtained mainly at the sacrifice of surface speed and radius of action.

The special circumstances governing the British naval operations in the North Sea during the World War gave rise to a demand for a submarine torpedo boat of very high surface speed, namely, 22 to 23 knots. This speed, in turn, involved a shaft horsepower (10,000 to 12,000) materially in excess of the then demonstrated capacity of the Diesel engine, so that, in order to meet the speed demand, recourse was necessarily had to the steam turbine. The scrapping by the British Admiralty of all the surviving boats except one and the installation of Diesel engines exclusively in all post-war construction supply additional proof as to the inherent inferiority of the steam-driven submarine.

Bath Iron Works Reopens as Shipyard

New organization will specialize in pleasure yachts and commercial craft up to 450 feet in length

THE recent announcement of the revival of shipbuilding at the Bath Iron Works, Bath, Maine, under the name of Bath Iron Works, Inc., is one of the most interesting and encouraging events that has occurred in the field of shipbuilding during the past year. The new organization is headed by William S. Newell, as president and general manager. With Mr. Newell are A. M. Main, vice president and naval architect, and William A. Truss, vice president in charge of sales.

The plant and equipment, which still remain at Bath, are in excellent condition and it is understood that new machinery designed for production work, both in the woodwork department and in the hull department, will be installed, so that the yard will be capable of meeting the requirements of construction of vessels up to 450 feet in length. The plant will actually be unique among the shipyards of this country, since it will devote its main attention to the construction of hulls, joiner work and the like, utilizing any special type of machinery that may be specified for a given job. It is not intended to operate a machine plant at the yard, but to purchase and install propelling and auxiliary equipment where it can be done under the most advantageous terms, and to meet any given requirements.

A history of the Bath yard covers a period of 45 years during which time many famous naval vessels, pleasure yachts and commercial craft were built and, in all, 53 ships were constructed for the United States Government, including the battleship *Georgia,* cruiser *Cleveland,* monitor *Nevada,* gunboats *Castine* and *Machias,* besides numerous torpedo boats and destroyers.

Included among the pleasure craft built at the yard may be mentioned the *Aphrodite,* built for Colonel Oliver H. Payne of New York and at the time of her launching in 1899 the largest pleasure yacht ever built in this country. Her overall length was 304 feet and her displacement was 1,823 tons. She was used as a patrol boat in the English Channel during the world war and has recently been sold to the Greek government. Other famous yachts built at the plant include the cruiser *Winchester* for Peter W. Rouss and now under charter to Vincent Astor; yacht *Isabel,* built for John N. Willys, now United States destroyer *125* attached to the China station; yacht *Virginia,* built for Isaac Stern of New York and yacht *Pantooset,* built for Colonel A. S. Bigelow of Boston.

CAREERS OF OFFICERS

The president of the new organization, W. S. Newell, who resigned as general manager of the shipbuilding plant of the American Brown Boveri Electric Corporation, Camden, N. J., was formerly with the Bath Iron Works for a period of 23 years, during the last eight of which he held the position of works manager. Mr. Newell was graduated from the Massachusetts Institute of Technology in 1899, and had considerable shipyard and sea experience in his early career. He is a member of the Society of Naval Architects and Marine Engineers, of the Institution of Naval Architects of Great Britain, an associate member of the American Society of Naval Engineers, a member of the U. S. Naval Institute and of the Engineers' Club of N. Y.

A. M. Main, vice president and naval architect of the corporation, studied naval architecture under Professors Biles and Barr at Glasgow University and was for a time associated with G. L. Watson, famous naval architect and

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Bird's eye view of Bath Iron Works shipyard

yacht designer of Glasgow. Mr. Main was naval architect at the plant of the Eastern Shipbuilding Company, Groton, Conn., during the building of the steamships *Minnesota* and *Dakota* and represented the late Charles R. Hanscom at their completion and delivery. During 12 years association with Harlan and Hollingsworth Corporation, Wilmington, Del., where he was successively draftsman, general superintendent and naval architect, he designed and constructed many successful vessels. When the United States entered the war Mr. Main became vice president and general manager of the Merrill-Stevens Company, Jacksonville, Fla. With the signing of the armistice he returned to Groton, Conn., as naval architect and subsequently became general manager of the Groton Iron Works where he completed nine vessels for the United States Shipping Board. He then returned to Wilmington, Del., to become consulting naval architect for the Pusey and Jones Company. During this period he was also vice president of William Griscom Coxe, Inc., naval architects and engineers of Philadelphia, Pa. Mr. Main is a member of the Society of Naval Architects and Marine Engineers and of the Institution of Naval Architects of Great Britain.

William M. Truss, who for the last six years has been general manager of marine sales of Pusey and Jones Company, Wilmington, Del., was associated for 26 years with William Griscom Coxe, Inc., of Philadelphia. During his career, Mr. Truss was with the Harlan plant of the Bethlehem Shipbuilding Corporation, Ltd., at Wilmington, Del., for 16 years, later spending some time in the main office of the corporation at Bethlehem, Pa., as superintendent of marine repairs of all the east coast yards of the corporation. He is also a member of the Society of Naval Architects and Marine Engineers.

Other officers of the company are Roland F. Hill, who is general superintendent in charge of the yard. Mr. Hill resigned recently as assistant superintendent of machinery installation at the north yard of the American Brown Boveri Electric Corporation, Camden, N. J., to take up his present position.

The treasurer of the new corporation, L. Eugene Thebeau, has been associated with the Maine Central Railroad Company for 24 years.

The first order placed with the reorganized Bath Iron Works is for the construction of a Diesel yacht designed by the firm of Henry J. Gielow, Inc., New York, for Ernest B. Dane of Brookline, Mass. This yacht will have a length overall of 240 feet, length on the waterline 220 feet, beam 36 feet and draft 14 feet 6 inches. The yacht will be given classification with Lloyd's Register of Shipping. The main propelling machinery will consist of two 1,500 horsepower Bessemer Diesel engines, which will give the boat a speed of 16 knots.

The yacht will be entirely of steel construction, designed with a straight bow and yacht stern. Accommodations include six staterooms and six baths. The owner's suite, consisting of stateroom, sitting room and bath, will be located on the main deck. The dining saloon, living saloon and smoking room will also be situated on the main deck. The yacht is to be delivered to the owners on August 1, 1928.

Bank of America Issues Complete Study of Hague Rules for Uniform Ocean Bills of Lading

AMERICAN shipping and banking interests are urged to rally behind a movement to have the United States ratify and adopt the Hague Rules for the uniform regulation of ocean shipments, in a study of the subject just published by The Bank of America. This monograph has been issued in an effort to correct the lack of specific data existing in business circles concerning this important subject.

The Hague Rules endeavor to codify and unify the dissimilar laws and practices of the different nations of the world relative to ocean bills of lading, liability of ocean carriers for losses and fixing the rights and immunities of ocean carriers generally. Great Britain has already adopted these rules in the form of new legislation, and bankers and shippers in the United States are urged to bring about similar legislation here. It is pointed out that the American Bankers Association, the U. S. Chamber of Commerce, the American Institute of Marine Underwriters and other leading bodies have endorsed the rules.

Under the present law, shippers at times find it impossible to collect loss and damage claims from ocean vessels, due to the inclusion of innumerable "exception" clauses in the bills of lading and because the law requires them to prove that the loss or damage sustained was due to the negligence or fault of the carrier. Hence, it is said, bills of lading have come to be known as "documents of irresponsibility." The result has been that bankers and ship-

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

pers never know the exact place where liability rests in case of shipments which are damaged or lost.

Explaining the reform accomplished by the Hague Rules, the pamphlet of the Bank of America states:

"Certain liabilities and responsibilities are imposed upon the ocean carrier, and certain rights and immunities granted; the carrier is permitted to increase his responsibilities and to grant additional privileges, but nothing in the bill of lading voiding any of the responsibilities laid down by the rules will be legally void.

"One of the most important stipulations of the Hague rules is that the owner of the goods has a year in which to file suit for loss or damage, regardless of whether or not any notice of claim has been given. To realize the importance of this change, it is only necessary to study the bills of lading which have been in use heretofore, and which have required claims to be presented and suits to be brought within a period so short that often a time limit had expired before the owner of the goods knew that a loss had occurred. It has been usual for bills of lading to bar claims if not presented within 30 or 60 days, and some bills were so drawn as to require the presentation of claims within 48 hours after the goods were delivered."

In his foreword to the study, Edward C. Delafield, president of The Bank of America, says that if the United States Senate ratifies the Hague Rules as modified by the Brussels International Convention, and Congress passes the necessary legislation, this country will probably serve as a determining factor in securing practically universal approval and uniformity in ocean bills of lading, regardless of the port of issue. He states that The Bank of America through its foreign department will furnish any additional information which may be required.

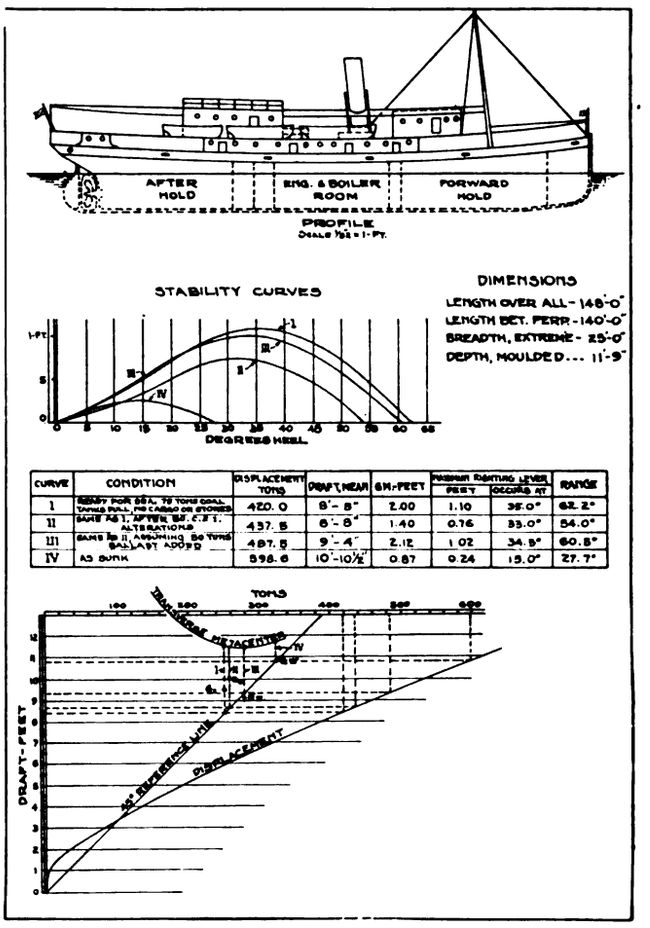
The Negros Disaster

By Lieut. Neil B. Musser, C.C., U. S. N.

AT 3:30 P. M. on May 26, 1927, the S.S.*Negros* capsized and sank just to the eastward of Banton Island. The *Negros* was a small inter-island freight and passenger steamer owned by Mr. Teodoro Yangco, the Filipino shipping magnate. It had left the port of Romblon the same morning, and the disaster occurred while the vessel was attempting to turn around and return to port in a typhoon of moderate strength, against which it had been unable to make any headway. Ninety-five of the passengers and crew were blown ashore on the Bondoc Peninsula of Luzon, clinging to life rafts and wreckage; and the balance, which included the master, were lost. Since no record was kept on shore of the names and number of passengers carried, it is unknown whether 49 or 80 lives were lost. It is certain, however, that the number of passengers on board bore no logical relation to the passenger accommodations and life saving equipment.

A Special Board of Marine Accidents was appointed immediately by the Philippine Government to investigate the disaster. Although there were four small commercial shipyards in the vicinity of Manila, including one operated by the Insular Government, there was not a single civilian naval architect available in the Islands. The Insular Collector of Customs therefore requested the Commandant of the 16th Naval District, Cavite, P. I., to furnish the necessary technical assistance to investigate the stability conditions which existed when the *Negros* was lost. It was especially desired to ascertain the effect on stability of certain alterations which had been undertaken on this vessel since its construction; and of the actual loading at the time of the disaster, as brought out in the first hearings before the Board. The following brief summary of the Cavite report should be of interest to all who are concerned with the unfortunate effects which result from inadequate shipping laws, and from lack of a competent inspection service to support those laws which already exist.

The following extremely brief discussion of stability will be of assistance in understanding the following paper. The two principal indicators of the stability of a vessel at any draft are the metacentric height, GM, and the curve of stability. The GM indicates the stability of the vessel when it is upright, and the curve of stability shows righting levers plotted against angles of inclination. The value of the righting lever shown on the stability curve, when multiplied by the displacement for which the curve is plotted, gives the righting moment in foot tons which would try to bring the vessel back to the upright position were it heeled to that particular angle. The range of stability is the angle at which the stability curve crosses the horizontal axis, since at this point the tendency of the vessel to return to the upright position disappears. Both of these characteristics are calculated on the assumption that the heeling forces act gradually in still water. It has been found by



CURVE	CONDITION	DISPLACEMENT TONS	DRAFT, MEAN	GM-FEET	MAXIMUM RIGHTING LEVER FEET	MAXIMUM RIGHTING LEVER OCCURS AT	RANGE
I	READY FOR SEA, 75 TONS COAL TANKS FULL, NO CARGO OR STORES	420.0	8'-8"	2.00	1.10	35.0°	62.2°
II	SAME AS I, AFTER 50 C.S.I. ALTERATIONS	437.5	8'-8"	1.40	0.76	33.0°	54.0°
III	SAME AS II, ASSUMING 50 TONS BALLAST ADDED	487.5	9'-4"	2.12	1.02	34.5°	60.5°
IV	AS SUNK	598.6	10'-10½"	0.87	0.24	15.0°	27.7°

Fig. 1

experience that if a new vessel possesses the GM, maximum righting lever and range of stability possessed by a number of successful vessels of the same type, the stability of the new vessel will also generally be satisfactory, even in heavy weather, when statical or slowly acting forces give way to dynamical or rapidly acting forces, and when wave action complicates the problem.

Curve 1 of Fig. 1 shows the stability curve of the *Negros* when originally designed as a Coast Guard Cutter for the Philippine Government. The stability in this condition is considered to be satisfactory for a sea-going steamship of this type. After its transfer to the Bureau of Commerce and Industry, the following alterations were undertaken to increase the passenger carrying capacity of this vessel: The

Generated on 2024-09-12 14:16 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

upper deck was extended to the side, beginning at the end of the bridge abreast the smoke stack, and this full-width deck was carried to the stern. An upper deck house was built, extending from the original engine room hatch to about 18 feet forward of the stern. Life rails, awning frames complete with awnings, and two pairs of davits were added on the upper deck.

Since the center of gravity of the added weight of 17.5 tons was 22.5 feet above the bottom of the keel, the center of gravity of the vessel was raised and the freeboard reduced sufficiently to bring about the stability conditions shown by Curve II, which are well below the minimum requirements of a sea-going vessel of this type. It is therefore considered that the Bureau of Commerce and Industry was partly to blame for the disaster, especially since the above calculations do not include any allowance for boats, life rafts, passengers, baggage and other high weights, which could not have been carried had these alterations not been undertaken. Furthermore, since the existence of the increased superstructure provided greatly increased windage area, wind pressure may have appreciably increased the heeling moment when the vessel capsized.

Now let us investigate the effects on stability which would have resulted had 50 tons of chain or scrap steel ballast been stowed in the bilges of the two holds, after the completion of the above alterations. Since most of this ballast could have been stowed in the pockets between the frames, it would have been necessary to have raised the original floor board level only about one foot, which would have caused no serious reduction in the volume of the holds.

From Curve III, it is seen that the addition of this ballast would have improved the stability to a point where the vessel could again have been considered seaworthy, providing that no deck cargo were carried, and that the number of passengers were strictly limited according to the requirements of good practice in proportion to deck and cabin space available. However, the addition of this ballast would have increased the draft to 9 feet 4 inches, which was the original designed load draft of the vessel. It is, therefore, considered that the alterations undertaken by the Bureau of Commerce and Industry were of too ambitious a nature, and had they been properly compensated for by ballasting, no useful load whatever could have been carried without overloading the vessel.

Now let us consider the actual conditions which existed when the vessel capsized. After its purchase by Mr. Yangco, the following alterations affecting stability were made. The after end of the main deck house was cut away to the main mast, which was removed. The forward end of this house was cut back to a point 22 feet abaft the foremast. The after end of the upper deck house was cut away to within 35 feet of the stern, but the forward end was extended one-third the length of the engine room hatch, which partly compensated for the portion removed. Two double drum steam winches were installed on the main deck, one just abaft the foremast, and the other between the main deck house and the after hatch. Two small wooden staterooms were constructed for the crew on the main deck near the stern, and one pair of davits were installed on the starboard side of the upper deck. The top of the new upper deck house was extended to the side, and life rails and an access ladder were added to this small promenade deck. It is estimated that no net effect on displacement or stability resulted from the above alterations. However, the alterations which were made to the main deck house made it possible to carry a great deal of deck cargo, which proved a temptation too strong to be resisted by the operators of the vessel; and the new promenade deck provided a high platform where passengers or deck freight might be carried.

The following data concerning the actual loading of the *Negros* at the time of the disaster were furnished by the Board:

Mean draft—10.88 feet. The vessel trimmed 1.75 feet by the stern, but the effect of this trim on the displacement was negligible.

177 tons of copra occupying 85 cubic feet per ton, 130 tons in the holds which were full, and 47 tons stowed on deck in sacks.

6 tons of marble dust stowed in sacks on after hatch.

About 115 passengers with baggage, distributed over upper deck as far forward as master's cabin, weight 7 tons.

4 life rafts on top of master's cabin, weight 1.25 tons.

3 tons of bananas stowed on promenade deck over upper deck house.

3 boats fully equipped, in addition to the two originally carried and included in calculations for conditions I, II and III, weight 2.4 tons.

16 tons of coal and 3 tons of fresh water, instead of 75 and 9.6 tons respectively, as assumed on board in conditions I, II and III.

30 tons of miscellaneous cargo unaccounted for, assumed to be concentrated at the center of gravity of the vessel as calculated from the above loading.

It will be noted from the above data that the vessel was loaded about 1.5 feet deeper than the designed load draft. If we correct the displacement corresponding to Curve II for the shortage of coal and water on board and for the loading given above, we find the stability conditions shown by Curve IV to have existed at the time of the disaster. The value of GM, maximum righting lever and range of stability given in Fig. 1 for this condition are far below the minimum which should be possessed by a sea-going vessel of this type.

It should be remembered that the main deck was not watertight as assumed in the stability calculations, but that at an inclination of only 25 degrees, the sills of the open and non-watertight doors in the main deck house were submerged, and the inflowing water rapidly accelerated the destruction of any small righting moment which may still have existed at that angle of heel. No doubt shift of deck cargo also helped to reduce the range of stability indicated on Curve IV. The range of 27.7 degrees shown on this curve is considered to be a relatively small angle of heel for a vessel of this size and type when rolling in the troughs of waves during typhoon weather.

In conclusion, it is considered that the three principal causes of the *Negros* disaster were the excessive draft and insufficient freeboard which resulted from overloading the vessel, the improper stowage of cargo and the alterations made to the vessel by the Bureau of Commerce and Industry.

Scales Instead of Curves for Ships' Forms

(*Continued from page* 16)

sions are carried down to 5 feet and the subdivisions down to 1 foot intervals and by interpolation by the eye could be read as close as 0.2 to 0.3 of a foot.

Fig. 7 shows the center of buoyancy forward of section 10 as calculated for 12, 14, 16, 18 and 20 feet as 6.10, 6.15, 6.12, 6.02 and 5.88 feet, respectively. As will be seen the main divisions are carried out to one one-hundredth of a foot, which, in this case, is close enough for all practical purposes.

There seems to be no question that the extra work connected with the making of the table Fig. 3 is completely offset by the convenience and precision it affords by reading the characteristics of the curves of form almost at once, and it is hoped that its use will be generally adopted.

Generated on 2024-09-12 14:16 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Capstaff-Hunter Turbine Works

Turbine Plant Establishes Repair Records

Capstaff-Hunter Turbine Works completes re-blading on S. S. Roma in four and one-half days

ONE of the most interesting repair jobs that has been carried out in the Port of New York recently was that of reblading the low pressure turbine of the Italian liner *Roma* while it was in place on the ship in a time of 4½ days. So far as is known this is a record for work of this kind and the Capstaff-Hunter Turbine Works, Inc., of Hoboken, N. J., deserves a great deal of credit for its accomplishment. This is but one of a long list of unusual turbine repairs which this company has carried out during the three years since it was established, all of which have helped to place the organization in a unique position among the ship repair plants of the Port of New York and along the east coast.

Although the company has made a specialty of turbine repair work, it has developed its organization and equipment to the point where it can handle any ship repair job in either the hull or machinery departments that does not require dry docking.

A little over a year ago plans were made to expand the plant and facilities of the company, which resulted in the construction of a modern concrete and steel building, with Fenestra steel windows at 13th and Grand streets, Hoboken. A second new building of concrete and steel construction is now being erected on property adjacent to the main plant. This building will house the boiler, welding and copper shop as well as the carpenter and joiner departments.

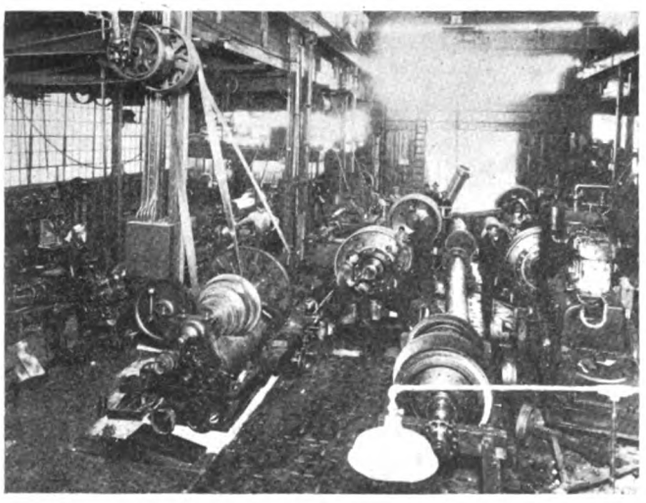
The main plant contains the heavy machine and turbine repair departments. The building, which has a length of 250 feet and a width of 100 feet, is arranged in three bays. The east bay contains lathes and other machine tools for production work, as well as the turbine blading department; in the center bay is located all of the heavy machinery, including one of the largest planers in the Port of New York, heavy radial drills, the bending floor and assembling floor; the west bay contains special machine tools, welding equipment, drill presses and the like, while along the west wall in this bay the tool and stock rooms are situated.

The executive offices are located on the second floor which is built into the north end and overlooks the machine bay. A storage yard is provided at the south end.

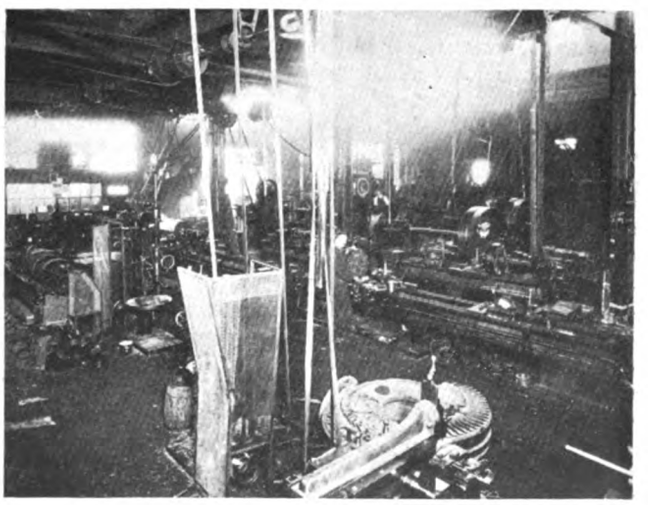
The building to be erected for boiler and pipe work will have a length of 100 feet and a width of 75 feet, and will be equipped with the most advanced tools for handling this type of work.

Machine Equipment in Main Plant

The machine equipment of the plant, which is very complete for all manner of ship machinery repairs, includes lathes from 10 inches to 84 inches swing; vertical boring mills from 36 inches to 108 inches; radial drills with 3-foot to 7-foot arms; slotters from 2 feet to 4 feet stroke; milling machines from 6 inches to 48 inches travel; shapers from 12 inches to 24 inches stroke; planers from 36 inches by 36 inches by 10 feet to 144 inches by 144 inches by 28 feet; face plate erecting floor 20 feet by 30 feet with special boring bars and apparatus to bore large turbine cylinders and engine beds; punching and shearing machines; portable electric welding machine for inside and outside work; 20-ton electric crane traveling full length of the shop; portable air compressor for inside and outside work.

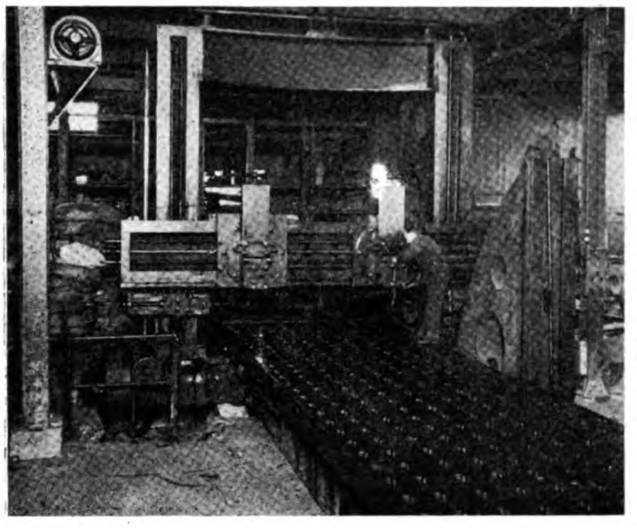


Gearing and turbine rotors undergoing repairs

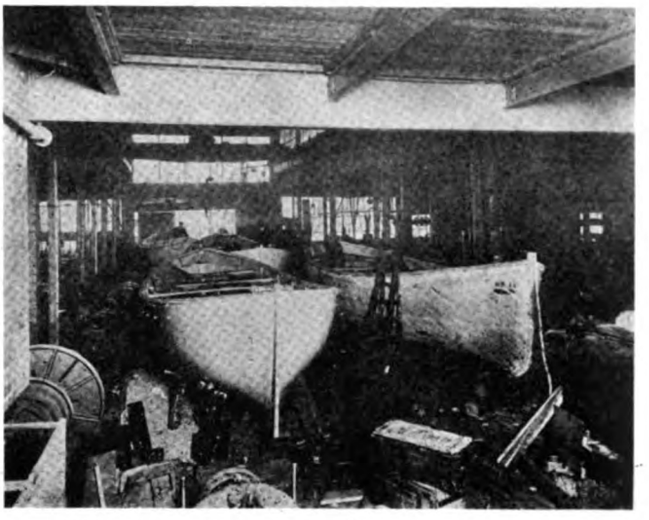


Looking southwest across the new shop

Generated on 2024-09-12 15:02 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Heavy planer recently installed



Lifeboats of S. S. Leviathan undergoing repair

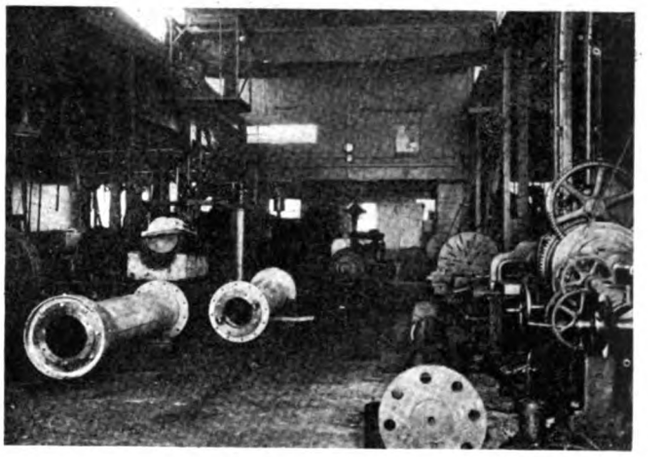
The organization includes the executives of the company, office staff, superintendents and an average of about 300 men. Of this number about 100 turbine experts and mechanics are engaged in the main plant. Since a great deal of work is done on the ships when in dock, repair crews are organized from the staff for any given job. These men carry on the work under the supervision of a superintendent. This system provides the greatest possible flexibility to the operations that are carried out and repairs can be made at any port or even on a ship at sea, since each crew is an independent unit of hull and machinery experts.

In the case of work on large turbines that would require weeks to complete if they were removed from their foundations, the Capstaff-Hunter organization handles such repairs rapidly and efficiently while the turbines are in place, using its blading and machine departments for the fabrication of blading and repair parts while the staff crew on the ship does the dissembling and finally the installation of new parts. The same system is followed by the boiler and engine repair gang, carpenters, joiner and hull staff.

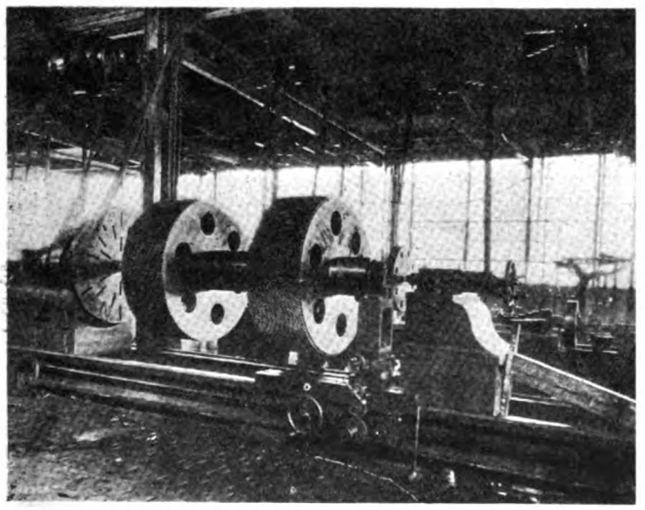
One of the illustrations herewith shows several of the *Leviathan's* lifeboats in the main plant undergoing repairs.

A record repair completed only a short time ago was the reblading of the low pressure turbine in place on the Italian steamship *Conte Biancamano* in a time of five days.

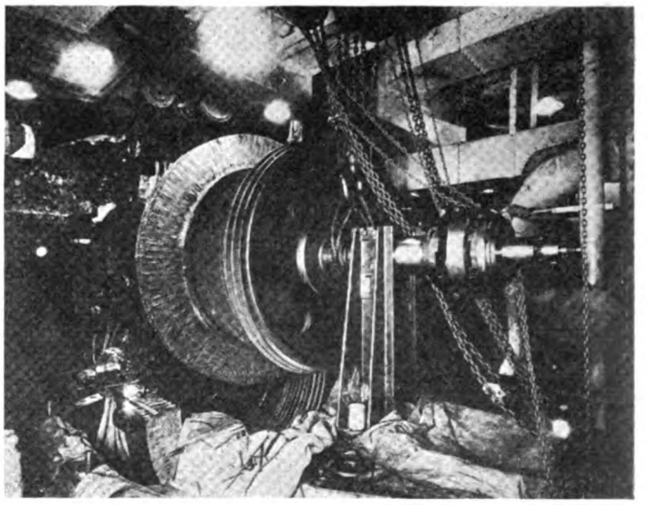
One other repair that deserves special mention, and which indicates to advantage the ability of the company to handle unusual jobs, was the repair made on the high pressure turbine of the steamship *H. F. Alexander,* while the ship was under way between New York and Miami. In this case the only dummy ring on the low pressure turbine was removed, a new one made and installed while the ship was at sea.



Center bay looking north



Truing up reduction gears for S. S. Dannedaike



Low pressure turbine repairs on S. S. Conte Biancamano

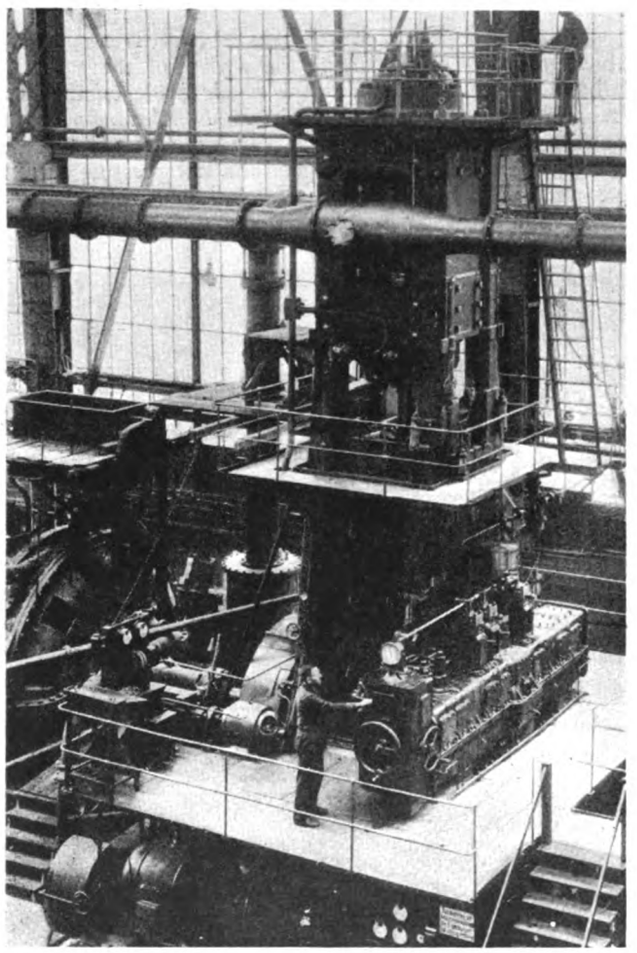
Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

New German Double Acting Diesel Engine

Four cycle engines abandoned in favor of the two stroke type — New design to be installed in Hamburg American cargo ships

By Our Special London Correspondent

IT is a curious fact that, in Europe, in different countries, various classes of Diesel machinery have found favor for the propulsion of ships. For instance, among Danish and Norwegian owners, four cycle engines are almost universal. In Germany, on the other hand, no owner will take motors of this class and only two cycle units are accepted, preferably of the double acting design. In England, both principles are employed, with perhaps, a bias towards the four cycle motor. It is a little difficult to understand why this situation should arise unless it is due to nationalist feelings, for it will be recalled that the four cycle engine has been developed to the greatest extent in Scandinavia, while in Germany builders have paid more attention to the two cycle principle.



1000 brake horsepower single cylinder experimental A.E.G. Hasselman double acting, two cycle engine

Nevertheless, after the war, one of the biggest engineering concerns in Germany, the A. E. G., took up a license for the manufacture of the Burmeister & Wain four cycle Diesel engine. They built considerable numbers for installations in ships; yet, after a time, they found that they were unable to compete with German-built, double acting, two stroke engines. Consequently, they decided to develop a new unit of their own, to embody the cardinal features which many engineers consider to represent the ultimate engine, namely, the two stroke, double acting principle and the employment of airless injection of fuel.

This latter characteristic represents, perhaps, the most important feature of the A. E. G.-Hesselman double acting, two stroke engine, as it is now called, in view of the fact that the A. E. G. has now adopted the patents of Hesselman, the Swedish engineer, who was responsible for the original design of the Polar Diesel engine probably 20 years ago. Following the practice that has always been adopted by manufacturers who intend developing a double acting, two stroke engine, the builders constructed a single cylinder 1,000 brake horsepower experimental unit which, apparently, so convinced the engineering advisers of the Hamburg Amerika Line as to its efficiency and reliability, that these owners immediately placed orders for three 10,000-ton cargo ships in which machinery of the A. E. G.-Hesselman type will be installed.

Low Fuel Consumption

It is well known that, although the results of the operation of certain double acting, two stroke engines have been satisfactory, the fuel consumption has not been altogether favorable. For instance, M. A. N. double acting, two stroke motors have shown figures up to about 0.44 pound per brake horsepower hour when driving their own scavenging pumps. Yet it is claimed with the A. E. G.-Hesselman motor that a figure of 0.37 to 0.38 pound per brake horsepower hour will be reached, including the power needed for the operation of the scavenging pump, whether it be direct driven or coupled to an electric motor.

This seems to be a remarkably good figure and is certainly equal to the best results achieved with the Burmeister & Wain double acting and single acting types, also with the Doxford engine, which is looked upon as, perhaps, the most efficient of all Diesel engines now on the market. Naturally, it is partly due to the fact that the air compressor is eliminated, for this represents a saving of probably 7 or 8 percent. It may be said that such low figures of fuel consumption have yet to be confirmed on large four or six cylinder engines, but against this, it may be remarked that a consumption of about 0.38 pound per brake horsepower hour is actually guaranteed for the engines which are to be installed in the Hamburg Amerika Line ships.

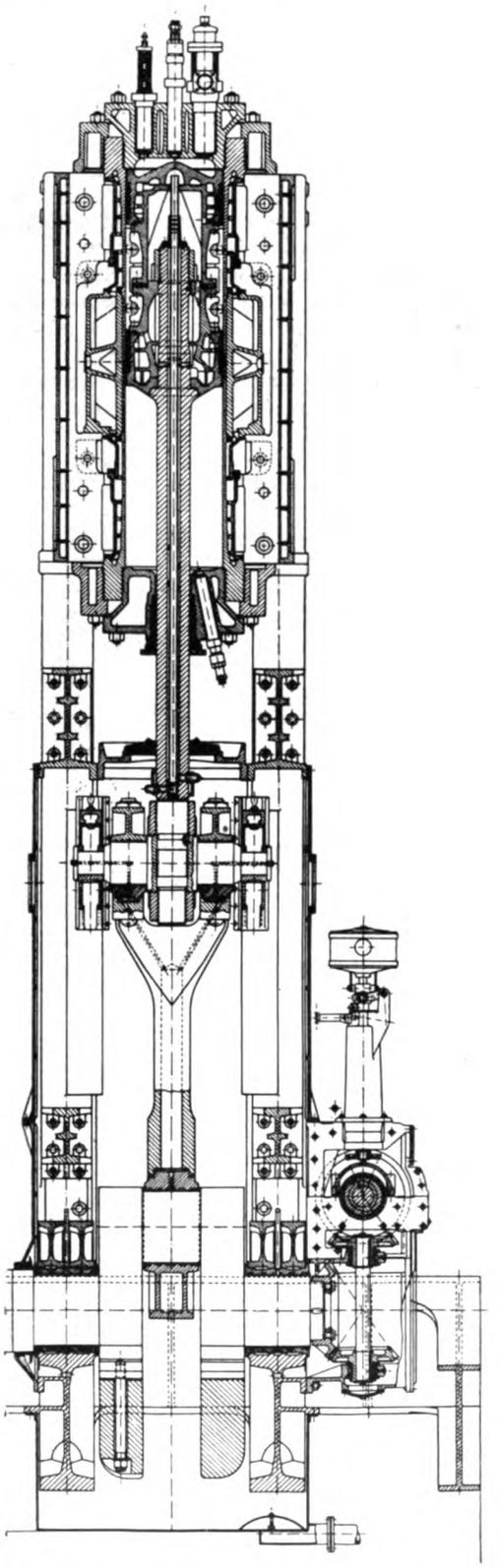
Low fuel consumption depends upon effective combustion and high mechanical efficiency. The latter is found to be nearly 90 percent in the new engine, and as regards efficient combustion, it is claimed that with the system of fuel spray employed, combined with the special shape of the combustion chamber and the particular means of introducing the scavenging air so that it retains a high speed of rotation after compression, the maximum efficiency of combustion that is possible is attained.

The working conditions are maintained as easy as possible and, similar to the arrangement adopted with nearly

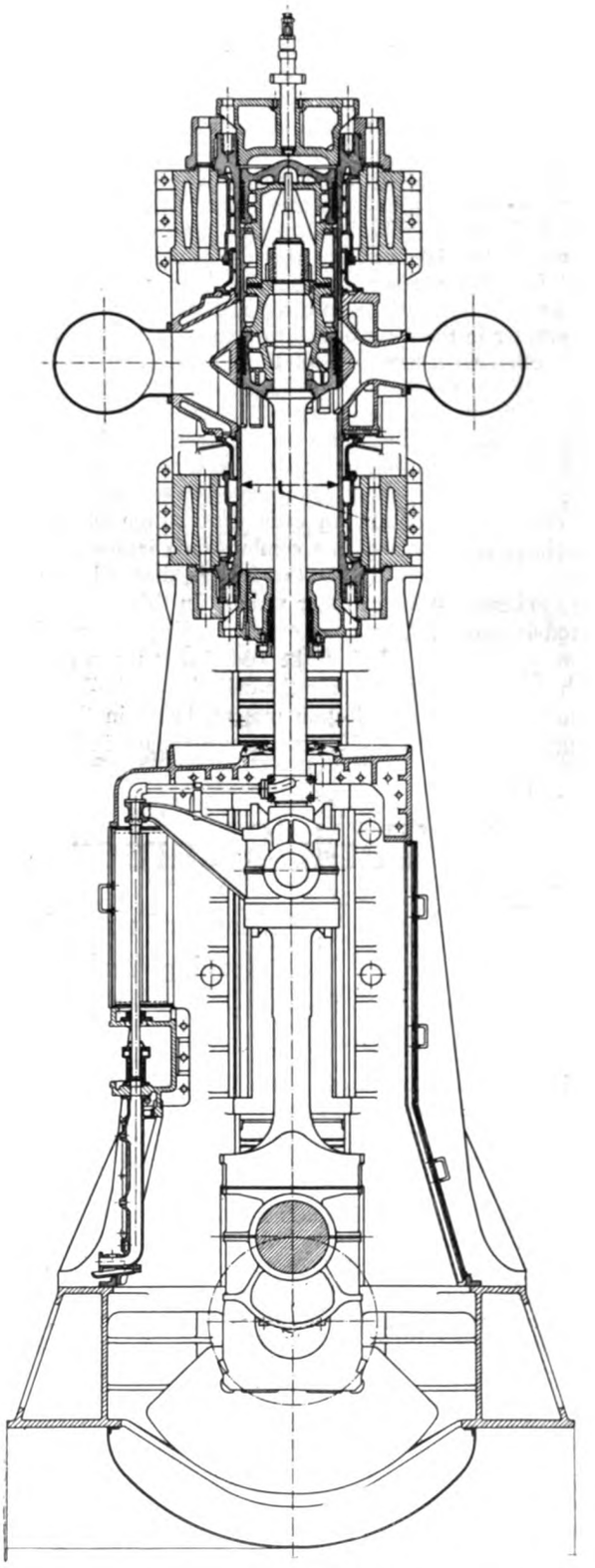
Generated on 2024-09-12 14:20 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

all other two stroke, double acting engines, the mean pressure is low. It is, in fact, very low, being only 75 pounds per square inch (m.i.p.), which is much less than that adopted in single acting motors or double acting motors of the four stroke design.

This is a point that is not always noted when the comparisons are made between the various classes of engines, and, as a result, the weight and the cost of a double acting, two stroke engine do not work out so low as might be thought possible. It is claimed that, with this unit, the weight is equivalent to about 15 brake horsepower per ton, but this is at a speed of 120 revolutions per minute, whereas in the ships in which it will be installed, it will operate at 90 revolutions per minute.



Longitudinal section through cylinder of new German engine



Transverse section of new A.E.G.-Hasselman engine

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The aim of the designers has been simplicity, although it should be remarked that simplicity does not, by any means, imply cheapness in construction: often the contrary. With this end in view, no mechanically operated valves are fitted, the fuel valves being automatic, and timed from the fuel pumps, while the starting air valves are actuated under air pressure, the necessary distribution of air being obtained through a distribution box near the control platform.

The fuel valve employed is the result of several years' experiments by Hesselman, and instead of having helical springs to close the valve, a series of membrane disks is used, held together by shrinking rings. These are sufficiently elastic to allow the maximum stroke of the valve, which is in the neighborhood of one hundredth of an inch. The nozzle has 10 apertures through which the oil is projected into the combustion chamber at a velocity of 550 feet per second, and it is so directed that it sprays out into the cylinder in the form of a fan from each nozzle, thus ensuring effective penetration of the small oil globules with the highly compressed air in the combustion space.

The difficulties in designing a highly efficient airless injection engine are indicated by the fact that it has been found desirable to employ no fewer than 10 pulverizing valves in the bottom cover, all operated from one fuel pump. The object is to obtain an even distribution of the fuel throughout the whole of the combustion chamber, and the sprays are so arranged that the fuel is directed outwards from the center to the cylinder walls. In this way, the piston rod is protected, to some extent, against the maximum heat of combustion. It is to be added that the pressure at which the fuel is injected into the cylinder is similar to that in most other airless injection motors, being in the neighborhood of 4,500 to 5,000 pounds per square inch.

Fresh water is utilized for piston cooling, being supplied through telescopic pipes with glands external to the crank case so as to prevent any possibility of leaking water mixing with oil in the engine sump. The cooling water passes up through a tube in the hollow piston rod and descends around the outside of this tube, as in orthodox design.

The remaining features of construction present no great novelty, although the shape of the scavenging ports is, of course, a matter of importance and has been evolved as a result of experiments with 33 different arrangements. This gives some idea of the care which has to be taken in developing a new Diesel engine, although, when the results are reached, there is often little to show for the prolonged work that has been necessitated.

The cylinder covers at top and bottom are similar, apart from the fact that at the bottom there have to be 5 holes for the reception of the 10 fuel valves, whereas, of course, the construction at the top is simplified owing to the smaller number of valves. A cast steel ring is used for holding the liner to the cylinder framework, but although in many recent designs long through bolts are employed extending from the top of the cylinder to the bed plate, this method of stiffening is not utilized in the A. E. G.-Hesselman engine.

The engine of which an illustration is given has a cylinder diameter of 26¾ inches and a piston stroke of 47¼ inches and develops 1,000 brake horsepower at 120 revolutions per minute. The builders claim that, with the experience they have gained, they are ready to proceed with the construction of 10-cylinder 15,000 shaft horsepower units with cylinders 33 inches diameter and a piston stroke of 47¼ inches, the total weight with such an engine being 1,130 tons.

Tank Steamer Fires and Explosions*

Standard rules for loading and discharging, cleaning and gas freeing tank steamers

By Robert L. Hague

DURING the period of nearly five and one-half years from January 1, 1922, to May 1, 1927, the world's tank steamer tonnage afloat averaged almost exactly 8,000,000 deadweight tons. There were transported in that period 135,000,000,000 gallons of petroleum products in bulk across 225,000,000 miles of ocean.

Against this all but incredible record of performance the aggregate number of fires and explosions in tank steamers, whether loading or discharging, undergoing repairs, or in free route at sea, has been but 57, or the remarkably small amount of thirty-two one-hundredths of 1 percent of all the marine casualties reported during the period, which numbered in excess of 17,600.

Petroleum Vapors

A large proportion of the crude petroleums and their refined products give off large quantities of vapor when exposed to free air at ordinary temperatures. These vapors are for the most part composed of hydrocarbons, although some crudes, notably the light Mexican, give off in addition hydrogen sulphide (H_2S).

Stated in the simplest terms, the hydrocarbon vapors from crude petroleum and its products, although differing in chemical composition, possess in common the following properties:

1. They are heavier than air and, therefore, in still air seek the low levels of tanks, containers or ships.
2. They are at all times flammable.
3. When present in air in relatively low concentrations they are intoxicating. Air containing as little as fourteen-hundredths of 1 percent by volume may produce a noticeable effect if breathed for several hours. It is usual, however, to consider three tenths of 1 percent as the danger limit. Most men can work in an atmosphere of this concentration for periods up to thirty minutes. Air containing more than three-tenths of 1 percent of petroleum vapors should not be breathed.
4. As the concentration increases, these vapors become also highly explosive; attended with scattering or disruptive effect. The explosive range extends from 1 percent to 6 percent by volume, being most intense up to 3½ percent. Above 6 percent the vapors for all practical purposes cease to be explosive and again become merely flammable.

The hydrocarbon sulphide gas (H_2S) given off by the Mexican crudes is not only flammable but is much more toxic than the hydrocarbon vapors. It has been found to be slightly toxic in concentrations as low as 0.005 percent, and men exposed daily to such percentages would, in all probability, suffer irritation of the eyes. In higher concentration this gas is definitely toxic and capable of producing dangerous and sometimes deadly effects when inhaled for periods not exceeding a few minutes.

*Abstract of a paper read at the thirty-fifth general meeting of the Society of Naval Architects and Marine Engineers, New York, November 10 1927.

Generated on 2024-09-12 14:16 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The fundamental of the problem of petroleum vapors lies in appreciation of the fugitive character of the gases generated; the fact that they are heavier than air; and lastly, that the danger of explosion is greatest when the uninstructed or uninformed person would expect it least—in other words, that it is associated not with the full tank, which is the relatively safe tank, but with the empty or indifferently cleaned tank; with leaky cocks, joints and rivets; with fractured petroleum oil pipes and settling tank gage glasses; with sediment around and under rivet heads; with leaky case oil containers; and with re-evaporation from rust and scale. These are the conditions under which danger screams out loud.

Causes of Past Fires and Explosions

The evidence is conclusive that, in the majority of cases, fires and explosions have had their inception through ignition of the vapors above described. The fact that petroleum vapors are heavier than air and are most explosive in low concentrations indicates that the compartments of greatest potential danger in a loaded tank steamer are the bilges of the pump rooms, the fire room bilges, and, when settling tanks are located therein, the engine room bilges.

In the pump room the congestion of piping under the floor plates, coupled with the possibility of small leaks, and the necessity of breaking joints for overhaul, all lend themselves to the accumulation and retention of vapors. A condition similar to that prevailing in the pump room bilges prevails, although to a lesser extent, in the fire room and engine room bilges. Accumulations of sediment and oil in the fire room have been ignited by burner flarebacks, while in the engine room, accumulations of gas or oil from broken pipes or leaky cocks, weeping rivets, or fractured gage glasses of settling tanks have been ignited by short circuits in portable lamps as in the pump room.

Gases accumulating in the main cargo tanks themselves during the processes of loading or discharging have been ignited by defective portable electric lamps introduced for examination of the loading level. There is also record of an explosion resulting from filling a recently discharged cargo tank with ballast water while leaving the tank lids open. The large volume of gas expelled through tank openings was ignited, followed by explosion and loss of the vessel.

Other than failures of electrical connections, the principal source of trouble in the ship has generally been carelessness by the ship's personnel, which has occurred in the galleys, crews' quarters and storerooms. Outside the ship there have been ignitions by the exhaust of gasoline launches and from towboat smokepipes, while there are at least two authenticated records of freak performance, one an ignition caused by the clashing together of steel girders being hoisted overhead, and another of disastrous explosion on an oil barge from sparks generated by the nails in the captain's boots on the steel deck, which ignited gases formed from leaky cocks. Fires have been caused also by the upsetting of naked lights on collision or hard groundings. Defective and dilapidated wharf structures have played their part.

The dispatch of tank steamers to repair yards for docking and overhaul introduces a new and more dangerous set of conditions, as in such cases every tank in the ship is a potential source of danger; while the chances of ignition, through the operation of acetylene torches, riveting or chipping hammers, or the careless use of matches, are materially increased.

From the foregoing, it will be seen that there are two general conditions which, so far as possible, have to be guarded against, namely, carelessness in loading or discharging, and inadequate cleaning of tanks and removal of gas from the vessel. A review of the major precautions which the Standard Oil Company (New Jersey), now the Standard Shipping Company, has found it expedient to adopt with respect to these matters may therefore be of interest.

Standard Rules for Loading and Unloading Tank Steamers

Condition of Valves and Discharge Connections before Loading.—A ship's officer is charged with the duty of satisfying himself that cargo lines and pumps are in suitable condition for receiving cargo by opening all valves to the cargo tanks and assuring himself of the absence of any contaminating water or slop oil in the lines, which, however, if found, is removed by bailing or other means prior to loading. He also sees that all valves are in good working order, that they seat properly, and that the stems are properly lubricated. All discharge connections not in use are blanked.

Connecting Cargo Hose.—The same officer also sees that a sufficient length of hose is used to insure adequate allowance for the movement of the vessel. He satisfies himself also that the hose is properly supported by means of canvas slings or wooden saddles, and that it cannot kink or chafe against the vessel's rails or stanchions.

When the vessel is moored to a wharf structure, cargo hose is bolted to the discharge connections; but, at sea loading terminals, clamps alone are used for attaching hose, with a wooden mallet at hand for use in emergency.

Short Circuiting Device.—For the purpose of grounding static electricity generated in the vessel and thereby eliminating sparking at the cargo connections when connecting or disconnecting the hose, an electric short-circuiting device is provided at all terminals. This short-circuiting device is probably the most important safety precaution that can be taken.

Whenever a short-circuiting device is in use care should be exercised to insure that no metal path is made around any insulated joints which may be fitted in the dock pipe lines. The whole purpose of insulated joints, which is to prevent the flow of stray currents through dock pipe lines, would be defeated by establishing metallic contact between the two sides of the joints.

Tank Tops.—Next in importance to the electrical grounding of the ship is the control of tank tops. These should be kept closed, but with the dogs slacked off and thrown back, thus providing safety release for any sudden upward rush of gas. All ullage plug holes on the tank tops should be covered with 200-mesh wire gauze or wet gunnysacks until the ullage plugs are permanently secured in place.

The loading of a tank steamer is, in general, a more risky proposition than the discharge of the same steamer. In the former case there is the upward rush of gases in the tanks and the danger of overflows to contend with, while in the latter the gases either settle in the tanks or are driven shoreward.

The general practice is to load as many cargo tanks as possible at the same time until the cargo enters the expansion trunks, when the number being loaded and the rate of loading are reduced to guard against overflow. The tanks are loaded to a point below the desired ullage for passage, and later topped off one at a time. The ullage is the vertical distance from the plug hole at the top of the expansion trunk to the level of the cargo. The fair average ullage is about 4 feet.

In general no cargo, with the exception of fuel oil or lubricating oil, should ever be loaded overall. Whenever, in exceptional cases, it becomes necessary to load other products overall, extraordinary precautions should be observed and a hose or canvas leg having no metal fittings inserted in the tank and securely lashed in place. Tank tops should be kept open only sufficiently to permit insertion of the hose, and the opening around it plugged with wet burlap or similar material.

Loading of highly flammable products during severe electrical storms should never be permitted. When loading such products all fires on the ship should be extinguished and shore steam used for the operation of auxiliary machinery and for the heating system. When discharging such products, however, it is considered safe to have the vessels use their own steam, unless shore regulations prevent, as they sometimes do, especially in foreign ports.

The latest practice in the transportation of the more volatile grades of gasoline is to equip the ships so that it is possible to seal the tank tops gas tight after loading, and to condense the gases generated instead of permitting free escape to the atmosphere as formerly. In warm weather the decks are cooled by circulating water pumped on board.

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

STANDARD PLAN FOR CLEANING AND GAS FREEING OF TANK STEAMERS

In January, 1922, the Standard Oil Company (New Jersey) instituted a Standard Plan for the systematic cleaning of its tankers, which sets forth in detail the precautionary measures to be taken under various conditions before repairs are carried out. This procedure has been rigidly followed in the port of New York for a period of five years, during which time over three hundred ships have been cleaned without the occurrence of a single accident.

The successive steps in this cleaning plan are steaming, ventilating, washing down, pumping dry and wiping up, followed by a final inspection. The intensity and duration of each process is governed by the conditions at hand and rests with the judgment of the supervisor. A minimum steaming period of 12 hours is, however, the accepted rule.

Steaming Tanks.—After making a preliminary survey of the tank to determine the approximate time required for steaming, the hatch cover and ullage hole are closed, but left unfastened, and steam at a line pressure of about 75 pounds allowed to enter the tank through the smothering line for the period considered necessary under the conditions revealed by the inspection, but at no time is a pressure put on the ship's structure, etc., ullage plug plates acting as safety valves. This operation is essential in order that the oil and sediment be sufficiently softened and loosened from the bulkheads, beams, etc., to permit of its being washed off with streams of hot water.

It is preferable when steaming tanks to introduce the steam as near the bottom of the tank as practicable and in such a way as to effect its even distribution throughout the tank. In certain instances, when dealing with exceptionally dirty tanks, caustic soda, introduced before steaming, has been found helpful.

Ventilating Tanks.—Upon completion of steaming the hatch cover is thrown back and a windsail rigged for the purpose of creating a circulation and of expelling the gas and steam within. On a still day, or if the gas content is unusually high, additional air is forced into the tank through a canvas duct by a turbine blower.

Washing Down.—When windsails and blowers have been rigged the process of washing down is begun by groups of four men equipped with 1½-inch hose connected to a hot-water line on which a pressure of not less than 65 pounds per square inch should be maintained. As the tank gradually cools and the amount of gas decreases, men equipped with life lines and, if necessary, gas masks, slowly descend the ladder, washing down the sides and beams as they go. A careful watch is maintained on deck for the safety of the personnel below. When the topsides and beams have been thoroughly washed, work is begun on the bottom by starting at the forward outboard corner of the tank and washing the oil and sediment toward the suction valves, from which point it is removed by the ship's pumps, which are kept in operation throughout the entire washing period. This oil and sediment, if the vessel be moored at a dock with facilities for handling the slop oil ashore, is discharged into the shore slop line. When this is not the case a barge is used to receive the oily waste and wash water from the vessel.

If, after the procedure above described, sediment still remains clinging to the bulkhead or other structural members in the tanks, a second steaming period is resorted to and washing down repeated.

Wiping Up.—It is absolutely essential, in order to be assured of a thorough job, to remove all sediment from the tank bottom after washing down and to wipe it perfectly dry. This is best accomplished by sending six or eight men into the tank with buckets, wooden scoops and mops, the sediment being collected in the buckets and hoisted on deck through the hatch. Special care should be taken to flush out adjacent pumps and that pipe lines and all suction and discharge valves should be kept open to the master valve on each side of the tank in question.

This arrangement of valves is maintained in effect at the time the chief chemical inspector collects samples of the atmosphere and makes his examination. Windsails and blowers are removed one hour before the chemical inspection is made. Final wiping up is accomplished by the free use of clean, dry and sterilized white rags.

Inspection.—When the tank is thoroughly dry an inspecting chemist enters and makes a final examination. If the condition of the tank meets with his approval he then collects for analysis and report a sample of the atmosphere near the bottom plating.

Gas Free Certificate.—In order that no possible misunderstanding may occur, two notations only will in future be permitted on the certificate describing the gaseous content of tanks. These are "Safe for Men and Fire," and "Not Safe."

The notation "Not Safe" is used when oil or dangerous sediment is present in the tank, when leakage from adjacent tanks is possible, or when the gas content of the air exceeds two-tenths of 1 percent. Under these conditions men are permitted to enter tanks only when equipped with life lines and gas masks and while a constant watch is maintained on deck for their safety.

The notation "Safe for Men and Fire" indicates that the gas content of all cargo tanks, cofferdams and pump rooms, in short all tanks except the cross bunker, is less than two-tenths of 1 percent, and have been passed by the inspecting chemist as "Safe for Men and Fire."

When vessels are sent to repair yards for overhaul and no work is necessary to the hull or deck in the vicinity of cargo tanks, all the cargo tanks are closed down, sealed and smothered with steam, there being sufficient steam in the tanks so that a slight vapor can be seen escaping around the ullage plates at all times. If, however, repairs are required to the hull, tank bulkheads, or to the decks over the tanks, then the entire vessel, with the exception of the cross bunker and including cargo pumps, pipe lines valves and pump room bilges, are cleaned and certified as "Safe for Men and Fire," as described above. At no time is a vessel permitted to go to a repair yard for repairs to hull or decks above the tanks when any of the cargo tanks except the bunker tanks are filled or partially filled with flammable oil.

Although the company does not claim that smothering a tank with steam renders it absolutely neutral to explosions, its experience in the past indicates that this procedure prevents the possibility of a flash back into the tank, due to the high concentration existing at the top of the tank. It considers smothering with steam to be safe practice in every respect.

FUTURE DESIGNS AND PRACTICE

In the matter of fire protection and fire-fighting methods, there appears to be room for considerable improvement, both afloat and ashore.

Water is of limited usefulness in quenching petroleum fires. If not applied in sufficient volume, it makes matters worse by scattering the masses of burning material. In the steam-driven vessels of the Standard Oil Company (New Jersey) steam smothering lines are led to all cargo spaces, bunkers, cofferdams, lamp room, paint locker and pump room. Boiler rooms are for the most part equipped with a gravity foamite (carbon tetrachloride) system, having an independent flexible hose connection with the engine room, which is further fitted with portable extinguishers of the acid and foam type. Officer and crew quarters, mess rooms and the upper deck structure generally are protected by the ship's fire main supplemented by portable extinguishers.

In all the Diesel-driven ships there has been substituted for the main steam smothering line, to the pump room, fore hold, cargo spaces, storerooms, motor rooms, fire room, etc., a chemical smothering line of the Lux (carbon-dioxide) type. There is also provided an auxiliary steam smothering line connected with the donkey boiler. The usual assortment of portable apparatus is also provided.

A device which is credited with having extinguished a blazing tank of oil 20 feet in diameter in less than a minute has recently been added to the list of equipment previously available.

Equipment of this type is installed in the motor rooms of many of our Diesel-driven tankers in addition to Lux, and, if included in the fire protection of tank steamers, wharves, bridge structures and canal locks generally, would materially assist in checking a petroleum fire; but when all has been said and done the fact remains that no perfection of mechanical equipment can discount carelessness, and that the only assurance of security lies in unceasing vigilance and conscientious performance of duty on the part of personnel.

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

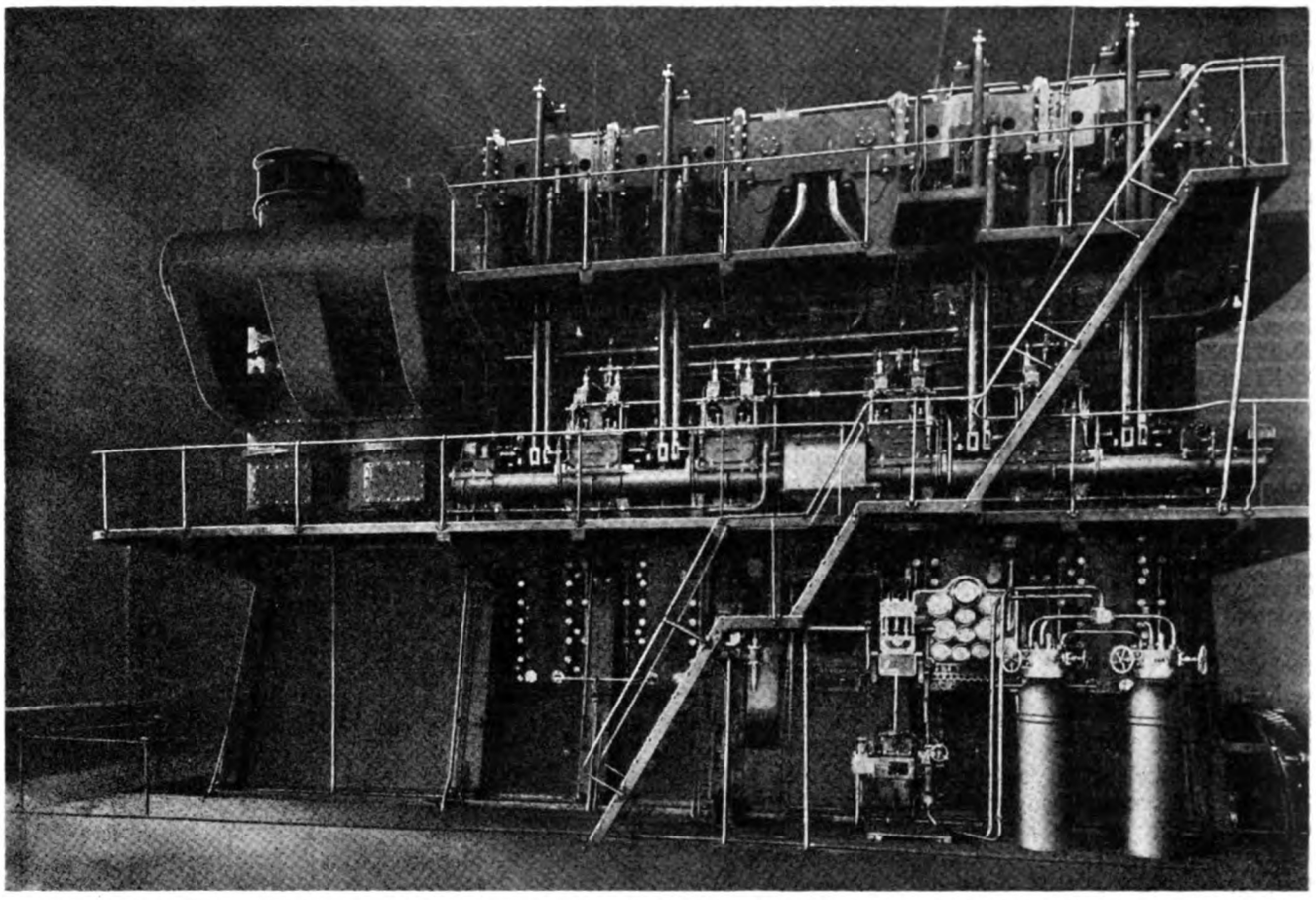


Fig. 1.—Four cylinder, two cycle, double acting Nelseco-M.A.N. Diesel engine of 3,680 brake horsepower

Test of Two Cycle Double Acting Marine Diesel Engine*

By Ernest Nibbs and Stephen A. Gardner

THE large two cycle, double acting Diesel engine is particularly adaptable for marine installations on account of its simplicity, its even turning moment and the moderate weight and space occupied. The most powerful engine of this type operating today is a nine-cylinder, 15,000 brake horsepower unit operating at 94 revolutions per minute at the Hamburg Electric Company, Germany. The most powerful marine installation are the four engines which have just completed their shop tests for installation on the passenger liner *Augustus* being built in Italy for Navigagazione Generale Italiana. This vessel is equipped with quadruple screws, and each propeller is driven by a 7,000 brake horsepower engine turning at 125 revolutions.

The subject engine is of German design, commonly known as the M.A.N. type. It was built for the United States Shipping Board by The New London Ship and Engine Company and will be installed in the S. S. *Wilscox*, a 9,500-deadweight ton vessel of the Oscar Daniels type. The main characteristics are as follows:

Type—two cycle, double acting.	
Rated brake horsepower	3,680
Rated revolutions per minute	115
Number of cylinders	Four
Bore of cylinders	27.5 inches
Stroke	47.25 inches
Diameter of piston rod	9.25 inches
Injection Air Compressor: Direct driven, two cylinder, three stage.	
Diameter of pistons:	
Low pressure	33.5 inches
Intermediate pressure	29.5 inches
High pressure	7.5 inches
Stroke	25.5 inches
Scavenging Pump: Direct driven, two cylinder, double acting.	
Diameter of cylinders	45 inches
Stroke	55 inches
Weight of engine	862,900 pounds

The outstanding feature of the M.A.N. two cycle engine is the arrangement of the exhaust and scavenging ports, both being located on the same side of the cylinder. The exhaust ports are opened about 50 degrees before crank center and the scavenging ports about 33 degrees before crank center. There are nine exhaust and nine scavenging ports for the upper half of the cylinder and ten exhaust and ten scavenging ports for the lower end of the cylinder. The scavenging ports are at such an angle that the scavenging air is first directed against the piston. Here it receives a reversal in direction, is forced through the length of the cylinder on the side opposite its entrance, across the head and back to the exhaust ports on the same side on which it entered, carrying with it all the products of combustion and leaving within

* Abstract of a paper read at the thirty-fifth general meeting of the Society of Naval Architects and Marine Engineers, New York, November 11, 1927.

Generated on 2024-09-12 14:16 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the cylinder a fresh supply of oxygen for the next working stroke.

The three-stage, two-cylinder air compressor is located between the working cylinders. Its first stage suction is so arranged that it may draw air either from the scavenging receiver or from the atmosphere. The scavenging pump is located on the forward end of the engine. It is a twin-cylinder, double acting pump.

The force feed lubrication is delivered to a header in front of the engine at about 25 pounds pressure. From this header, branches are led to each of the eight main bearings and thence upward through the connecting rods to the crosshead bearings and guides; branches are also led to the camshaft bearings, fuel pump drive and vertical shaft.

The main cylinders, air compressor and scavenging pump pistons and piston rods are lubricated from mechanical oilers so timed that the oil is delivered while the pistons are opposite the oil ports. As these mechanical oilers are fed from a gravity tank, hand oiling is reduced to a minimum.

Fuel is led from the gravity tank to each of the fuel-measuring pumps. The discharge from the fuel-measuring pump to the upper end of the cylinder goes direct to the upper spray valve. The fuel discharge from the lower fuel pump first goes to a four-way manifold where it is distributed to each of the lower spray valves. The amount of fuel delivered to the engine is controlled by a spill valve, which bypasses fuel from the discharge side of the measuring pump to the suction. This spill valve is controlled by the throttle and also by the governor.

Salt water for cooling is delivered to a header at about 20 pounds pressure, from which branches are led to the working cylinder jackets, air compressor jackets, air coolers and crosshead guides, and all are eventually discharged through the water jackets of the exhaust headers. Fresh water is used for cooling the pistons via telescopic pipes attached to the crossheads by means of rigid brackets.

Reversing of the engine is accomplished by a single lever hung on gimbals and operates through two cycles—one forward for starting the engine ahead, and the other aft for reversing the engine, returning in both cases to a common gate between the two cycles. If the lever is pushed away from the operator, the engine is stopped, owing to the fuel pumps being cut out. The lever can then be moved forward or aft, operating the appropriate valves for moving the main valve gear into the ahead or astern position. This is effected by air acting on a hydraulic cylinder, moving the cam shaft longitudinally. When the gear is hard over in the desired direction the lever can be pulled forward toward the operator, admitting starting air to the engine. The fuel and injection air are then put into action. At this point the lever is once more in the middle groove, and when pushed forward to the running position, which is the same for ahead or astern, starting air is cut off.

THE TEST

The power was absorbed by a Froude hydraulic dynamometer, size No. H. S. 15, which was rated as follows:

65 to 160 R.P.M.—Maximum B.H.P. 2,000.
80 to 160 R.P.M.—Maximum B.H.P. 4,000.
102 to 160 R.P.M.—Maximum B.H.P. 8,000.

The engine was started at 8:46 a. m., Friday, June 17, and was run continuously without adjustments and without stop until the evening of July 18. Data for the thirty-day full-power continuous run were started at 9:30 p. m. on Friday, June 17, and finished at 9:30 p. m. on Sunday, July 17. Immediately upon the completion of this run the throttle was opened and the engine run for six hours at 10 percent overload, or 4,036 horsepower at the same revolutions per minute, followed immediately by a four-hour test during which the revolutions were increased by 5 percent to 121 and the power to 4,250 horsepower, or a total overload condition of 15 percent. This test was immediately followed by a test of six hours at three-quarter power, four hours at one-half power, and finally two hours at one-quarter power before the engine was shut down. This shut down was only for a moment, however, as this test was immediately followed by one hour with the engine operating in the reverse direction, followed by a one-hour maneuvering test.

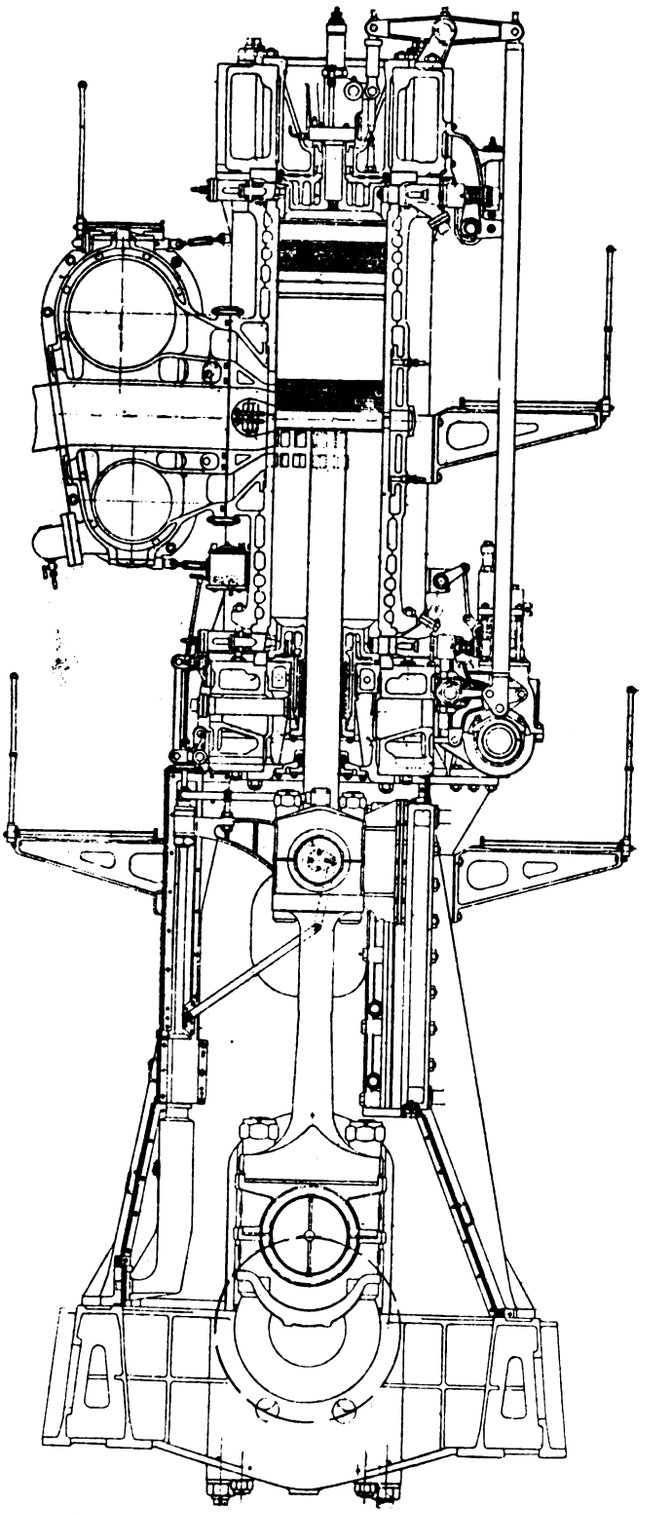


Fig. 2.—Transverse section through cylinder

Samples of fuel oil were taken by the Shipping Board daily for analysis, and the average results were as follows:

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

	30-day		July 17-18	
Baume gravity	25.6		25.1	
Viscosity at 77° F. Furol	19	seconds	21	seconds
Hydrogen	12.5	percent	12.3	percent
Oxygen and nitrogen	0.62		0.90	
Carbon	85.82	percent	85.48	percent
Sulphur	1.06	percent	1.32	percent
Heat value, B. T. U.—high	19,164		18,979	
Heat value, B. T. U.—low	18,071		17,903	

The exhaust was clear throughout the thirty-day run and during the overload and varying power tests. The average result of daily analysis throughout the thirty-day test is as follows:

Composition by volume—carbon monoxide	0		
carbon dioxide	3.72	percent	
nitrogen	80.80	percent	
oxygen	15.4	percent	
Sulphur contents by weight	0.004	percent	
Moisture contents by weight	1.62	percent	

The lubricating oil consumption for this type of engine is, of course, much lower than on the trunk piston type, as, due to its construction, the only lubricating oil that reaches the working cylinders is pumped in by the automatic lubricators and is under the control of the operator. The consumption during the thirty-day test was as follows (per 24 hours):

	Gallons
Power cylinders and piston rods	19.36
Force feed and scavenging pumps	10.90
Air compressor	0.45
Hand feed	1.60
Total	32.31

Brake horsepower hours per gallon:

$$24 \times 3{,}679 \div 32.31 = 2{,}732$$

On account of the importance of making a continuous non-stop run, the lubricating oil to the power cylinders and hand feed was not restricted. Under service conditions, this consumption will be materially reduced. It has been demonstrated on preliminary runs that the oil used in the power cylinders can easily be reduced by 50 percent.

A summary of the remaining data taken during the series of tests will be found in Table 1.

Throughout all preliminary runs at various speeds and power, the engine was found to be entirely free from torsional vibrations at all speeds and was remarkably free from all vibrations except for one rough spot between 95 and 101 revolutions per minute.

Within this range, the horizontal component of the reaction of the connecting rods acting on the crosshead guides caused sufficient sideway vibration to make it unwise to run for long periods. It is anticipated that this rough spot will, after installation, occur lower down in the speed range on account of the greater elasticity of the ship foundation.

The brake horsepower of the engine was calculated from the observed revolutions per minute and the effective weight on the brake, which is maintained constant by keeping the brake scales in balance. The maximum variation in revolutions per minute during the thirty days varied from 114.8 to 115.01 with a mean value of 114.98.

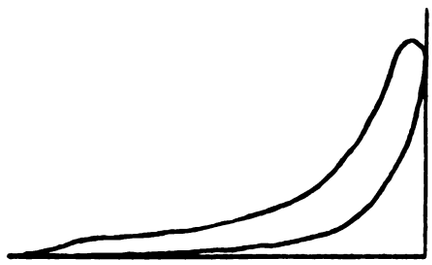


Fig. 3.—Typical indicator card—top end

The indicated horsepower throughout the thirty-day test was calculated from two sets of indicator cards taken daily. Typical indicator cards from the top and the bottom of the working cylinders are shown in Figs. 3 and 4. The determination of indicated horsepower in this manner is dependent upon the accuracy of the indicator and the accuracy of determining its area, and only shows the momentary condition during the time in which the indicator card is taken. It is only natural to expect that these readings should not be quite as consistent as the other daily readings.

It will be noted from these cards that the power developed in the upper cylinder is greater than that developed in the lower cylinder, that the card on the upper cylinder is flat on top, whereas that on the lower cylinder is more peaked. This is characteristic of most double acting Diesel engines and is probably caused by the unequal velocity of the piston as it nears the upper and lower limits of its stroke, due to the angularity of the connecting rod. It is a well known fact that these velocities are much greater near the top of the up stroke than at the corresponding point near the bottom of the down stroke, in which period the fuel is sprayed into the cylinder and burned. As a result, it is much easier to obtain a flat indicator card at the top, as the time the fuel is burning any increase in pressure is compensated

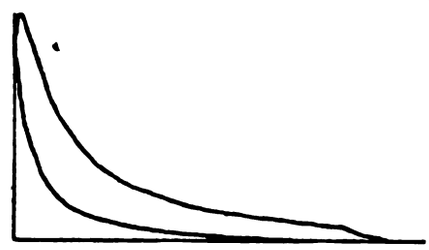


Fig. 4.—Typical indicator card—bottom end

TABLE 1

TEST OF A TWO-CYCLE, DOUBLE-ACTING MARINE DIESEL ENGINE

SUMMARY

Date	June 17 to July 17	July 16-17,'27	July 17	July 18	July 18	July 18	July 18
			10%	15%			
Power	Full power	Full power	overload	overload	75%	50%	25%
Duration of test	30 days	24 hrs.	6 hrs.	4 hrs.	6 hrs.	4 hrs.	2 hrs.
R. P. M.	114.98	115.01	115.0	121.09	104.5	91.46	72.86
B. H. P.	3,679	3,680	4,036	4,250	2,762	1,838	925.3
I. H. P.	5,074	4,851	5,217	5,464	3,780	2,723	1,594
I.H.P. air comp.	345.6	352.9	390	387	316.5	258	217
I.H.P. scav. pumps	339.8	392.7	402	446	289.8	211	92
Mech. eff.	72.50	75.9	77.4	77.8	73.1	67.5	58.0
M.I.P. power cyls.:							
Top	88.02	85.39	91.99	89.91	72.97	60.37	46.89
Bottom	75.58	70.84	76.08	77.45	61.15	49.92	33.81
Mean	82.1	78.5	84.4	84.0	67.3	55.4	40.7
M. E. P.	59.5	59.5	65.3	65.3	49.2	37.4	23.6
FUEL							
High heat value	19,149	18,979	18,979	18,979	18,979	18,979	18,979
Low heat value	18,071	17,903	17,903	17,903	17,903	17,903	17,903
Lbs. per hr.	1,688.3	1,719	1,923.8	2,077.5	1,285.5	889.75	541.5
*Lbs. per I. H. P. per hr.	.324	.343	.359	.369	.331	.318	.331
*Lbs. per B. H. P. per hr.	.447	.452	.464	.475	.452	.471	.569
Thermal eff.	.308	.304	.297	.290	.304	.292	.242
PRESSURES							
Barometer	30.03						
Injection air	1,100	1,130	1,150	1,183	1,008	850	740
Scavenging air	2.61	2.82	2.7	2.9	2.5	2.4	2.4
Jacket cooling water	21.2	21.6	21.0	23.0	23.0	21.5	20.0
Piston cooling water	37.8	41.2	45.0	41.2	42.5	29.5	23.5
Lubricating oil	27.0	27.9	28.0	28.0	28.0	29.0	31.0
TEMPERATURES							
Atmosphere	69.6	75.9	69.0	68.0	77.3	76.5	70.0
Engine room	80.7	85.4	82.0	83.0	84.1	83.7	84.0
Fuel oil	73.5	77.8	74.0	75.0	78.0	80.0	80.0
Injection air	71.0	76.2	74.0	75.0	76.3	74.0	72.0
Exhaust	514.0	525.0	578	609	410	325	267
Jacket cooling water:							
Inlet	70.7	73.4	72.0	76.0	71.6	70.0	70.0
Outlet	108.2	110.0	110.0	111.5	106.0	107.0	100.0
Piston cooling water:							
Inlet	67.6	69.9	72.0	72.0	70.5	70.0	70.0
Outlet	106.0	105.2	104.0	108.0	105.0	100.0	98.0
Scav. receiver	129	133.0	131	138	124	117	106.0
Lub. oil from eng.	106	110	108.0	108.5	108.3	105.2	103.0

* Corrected to 18,500 B.T.U.

Generated on 2024-09-12 14:58 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

by the speed at which the piston is moving, thereby rapidly increasing the volume and maintaining an approximately even pressure during the first stages of combustion.

Due to the relatively slow-moving piston at the bottom of the stroke, the rapid burning of the fuel causes a high initial pressure, and in order to keep this high initial pressure within limits it is necessary to adjust the timing and reduce the amount of fuel; in other words, the bottom side was favored as against the top. It will be noted from Table 1 that the mean indicated pressure on the top cylinders was 88 pounds, whereas that on the bottom was 75.6 pounds.

The mechanical efficiency is taken as the ratio between the indicated horsepower and the brake horsepower. It increased from about 72 percent at the start of the thirty-day trial to 75.5 percent at the end of the trial, due to the working in of the bearings, pistons and piston rings, thereby reducing the horsepower absorbed by friction.

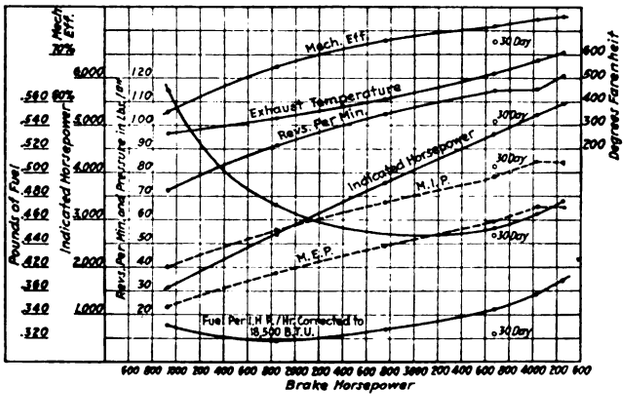


Fig. 5

The fuel consumption during the first five days of the test dropped from 0.44 to 0.435 pound per brake horsepower and then gradually increased until the end of the run, when 0.456 was noted, an increase of about 4.8 percent with a mean value of 0.447.

The scavenging pump pressure increased from 2.31 pounds at the start to 2.82 pounds at the finish of the thirty-day test. This was caused by a restriction in the exhaust ports caused by a deposit of carbon. This was of course reflected by an increase in indicated horsepower required by the scavenging pumps. This condition is characteristic of all port scavenging engines, especially when new and excess lubricating oil is used in the cylinders, and should not be considered in any way detrimental, as it is shown by service conditions that, after a certain point has been reached, the pressure of the exhaust and the natural shape of the exhaust nozzle formed by the carbon deposit prevent further restrictions. This condition probably accounts for the 4.8 percent increase in fuel consumption from the beginning to the end of the test.

The temperatures throughout the test of the circulating water, piston cooling water, lubricating oil and exhaust are unusually uniform. It will be noted from Table 1 that the average temperature of the exhaust was but 514 degrees and the maximum variation between any two days was less than 7 percent.

On Fig. 5 curves have been plotted for indicated horsepower, efficiency, revolutions per minute, M.I.P., M.E.P., and fuel consumption as determined by tests at varying loads reported in Table 1. It will be noted in plotting these curves at full power that data taken during the last twenty-four hour period of the thirty-day test—that is, from noon on July 16 to noon, July 17—have been used. The reason for this is that the averages of the thirty-day run are not consistent with the results at the end of the thirty-day run, at which time the varying power curves were made. Most published data show the results of such tests under ideal shop conditions with clean valves and clean ports. These curves should show the actual conditions to be expected after installation on shipboard, and the differences between the two conditions are indicated, as average results of the thirty-day test are also plotted.

It is believed that the results of these tests, coupled with the service reports on prior installations, conclusively prove the reliability of large two cycle, double acting, port scavenging, air injection engines.

Critical Speeds—II*

By F. McAlister, A.M.I.N.A.

IN a former article, there was outlined the methods leading up to the enunciation of two formulæ whereby the humps and hollows on a resistance curve were predicted. These formulæ were as follows:

$$\text{Critical speed } V = 1.34\sqrt{\frac{Le \times w}{n}} = 1.34\sqrt{\frac{L-(Lr \times w)}{n}}$$

where V is the speed in knots, Le, L and Lr are the lengths of entrance, total ship and run respectively, and n for humps is ½, 1½, 2½, etc., and for hollows, 1, 2, 3, etc.

*The first article on "Critical Speeds," by Mr. McAlister, was published on page 291 of the May, 1927, issue of MARINE ENGINEERING AND SHIPPING AGE.

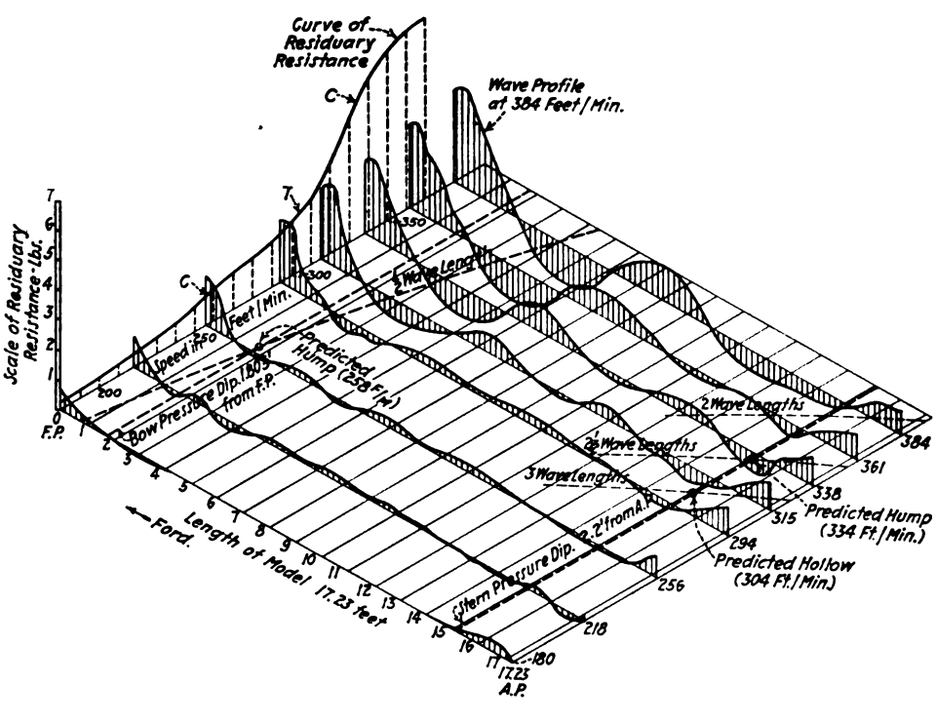


Fig. 1.—Model III D (Kent, I. N. A. 1915). Wave profiles and residuary resistance

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

We will now proceed to show the application of the formulæ to cases which are on record, and for our purpose will take the first example from Mr. Kent's paper before the Institution of Naval Architects in 1915. In this paper he gave curves of wave profiles for one particular model—111D—and cross curves of resistance for the family of models from which the complete curve for 111D could be constructed. These sets of curves have been reconstructed and are presented in perspective fashion in Fig. 1.

Fig. 1 shows diagrammatically the growth in the wave system for increase in speed and, at the left hand side, the corresponding growth in the resistance curve. Attention is drawn to the peculiar formation of the wave outline in the trough of the bow wave for the speed of 294 feet per minute. This speed, according to the resistance curve, is just over the first definite hump.

It has been stated before that a hump may be expected on the resistance curve when the trough of the residuary bow wave synchronizes with the position where the defect in the pressure curve indicates a negative wave system is in process of formation. The irregularity in the wave outline at 294 feet per minute is some indication that it is the residue of a much greater disturbance than has already taken place in passing over the lower speed at which the hump occurs—a speed of approximately 260 feet per minute. If the hump due to the interaction of the wave systems at the bow had been predicted, the procedure would have been as follows.

MODEL 111D

Length.	L=17.23 feet
Length of entrance.	Le= 5.60 feet
Prismatic coefficient, entrance.	ϕe= 0.672
Length of run.	Lr= 5.60 feet
Prismatic coefficient, run.	ϕr= 0.638

Thus, $w=3\ (1-\phi e)^2=3\ (1-0.672)^2=0.322$

$$V=1.34\sqrt{\frac{Le\times w}{\frac{1}{2}}}=1.34\sqrt{\frac{5.60\times 0.322}{\frac{1}{2}}}$$

V = 2.544 knots = 258 *feet per minute.*

which is practically correct.

The next critical point on the resistance curve is the hollow at a speed of approximately 305 feet per minute and judging from the adjacent wave profile for 294 feet per minute it is to be expected that three wave lengths will separate the stem from the depression near the stern. The critical speed for this hollow would have been predicted as follows:

$$w = 3\ (1-\phi r)^2=3\ (1-0.638)^2=0.393.$$

$$V=1.34\sqrt{\frac{L-(Lr\times w)}{3}}$$

$$V=1.34\sqrt{\frac{17.23-(5.60\times 0.393)}{3}}$$

V = 3.00 knots, or 304 *feet per minute.*

which is also practically correct.

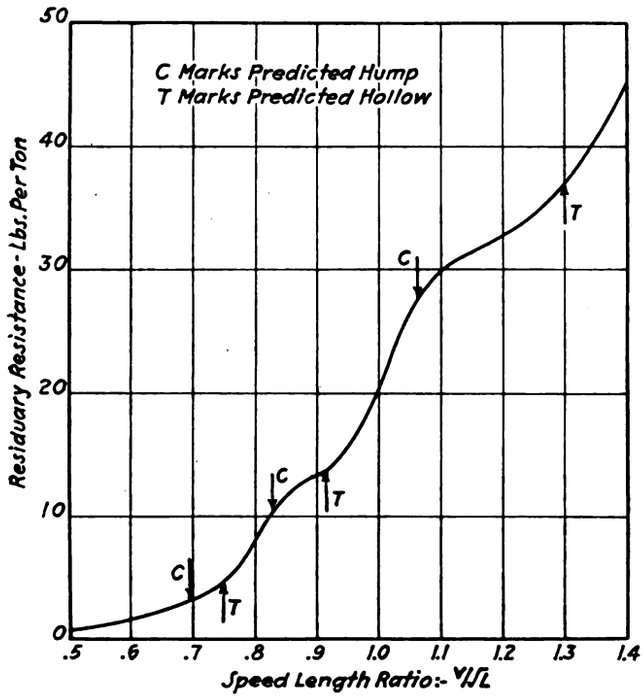


Fig. 2.—Taylor's experiments. $\Delta/(L/100)^3 = 57.4$. No parallel body

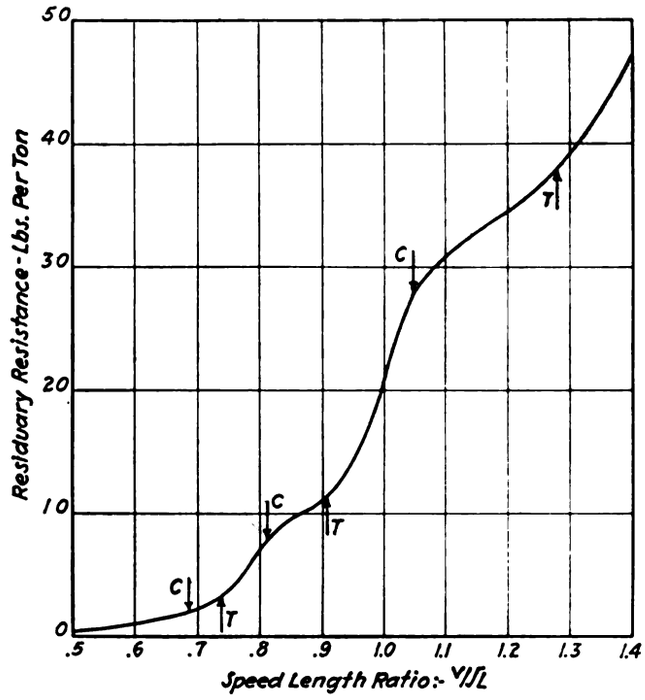


Fig. 3.—Taylor's experiments. $\Delta/(L/100)^3 = 57.4$. Thirty percent parallel body

The third critical point is the largest hump shown on the resistance curve, occurring at approximately 335 feet per minute. The predicted speed for this hump having 2½ wave lengths as its variable n would be as follows:

$$V=1.34\sqrt{\frac{17.23-2.20}{2\frac{1}{2}}}$$

V = 3.29 knots, or 334 *feet per minute.*

which follows, of course, the well known root sequence first enunciated by R. E. Froude.

On the diagram, as a graphical illustration of the foregoing, there has been plotted, the "w" length of both the entrance and run, together with the trace of the theoretical wave crests and hollows, which indicate, remarkably well, the synchronism of waves and pressure points.

In order to illustrate the application of the foregoing to any type of vessel, we can take the cases given by Taylor in his paper before the Society of Naval Architects and Marine Engineers in 1908. In this paper he gave particulars of two models both having a fatness ratio of 57.4, both having a prismatic coefficient of 0.80, but one having no parallel body and the other having 30 percent parallel body. The corresponding resistance curves are shown in Figs. 2 and 3.

The calculation for the major hump in the no parallel body case would be as follows:

Generated on 2024-09-12 14:16 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

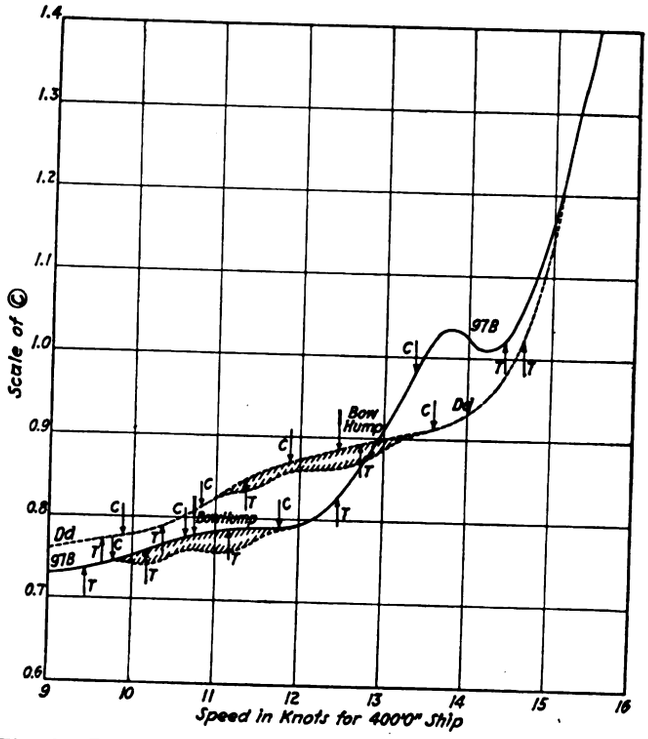


Fig. 4.—Curve of (c) for models 97B. Prismatic coefficient, 0.812, prismatic coefficient, 0.811

$$w = 3\ (1-0.8)^2 = 0.12.$$

$$Lr = \frac{L}{\frac{1}{2}}$$

$$\therefore \frac{V}{\sqrt{L}} = 1.34 \sqrt{\frac{L - (0.50 \times 0.12L)}{0.50L}}$$

$$= 1.838.$$

And applying the root sequence we have

Hump speeds $V/\sqrt{L} = 1.06,\ 0.822,\ 0.694,$ etc.

Hollow speeds $V/\sqrt{L} = 1.30,\ 0.918,\ 0.75,$ etc.

These points are marked on the resistance curve in Fig. 2, and indicate the accuracy of the prediction.

Turning to the second case, we must first find the length and prismatic coefficient of the run, making the assumption that the ends are of equal fullness and the centre of the parallel body coincident with the midship section.

From the formula, ϕ ends $= \frac{(\phi t - \gamma)}{(1 - \gamma)}$ where ϕ ends and ϕt are the prismatic coefficients of the entrance and run combined and the total ship respectively and γ the percentage length of parallel body, we have, in the case under observation, a prismatic coefficient of 0.714 for the ends, also Le is equal to Lr and in turn is equal to 0.35L. The major hump would thus occur at a speed length ratio of

$$\frac{V}{\sqrt{L}} = 1.34 \sqrt{\frac{L - (Lr \times w)}{\frac{1}{2}L}}$$

and $w = 3\ (1-0.714)^2 = 0.245.$

$$\therefore \frac{V}{\sqrt{L}} = 1.34 \sqrt{\frac{L - (0.35L \times 0.245)}{\frac{1}{2}L}}$$

$$= 1.81.$$

and applying the root sequence we have

Hump speeds $V/\sqrt{L} = 1.045,\ 0.810,\ 0.684,$ etc.

Hollow speeds $V/\sqrt{L} = 1.280,\ 0.905,\ 0.74,$ etc.

These points are correspondingly marked on Fig. 3, and also show the accuracy of the prediction. The differences from the first case are small, but would have been graphically capable of determination if the resistance curves had been continued upwards to the major hump. In both of Taylor's examples the interference at the bow occurs at such a low speed length ratio that the hump which should naturally be present at this point is smoothed out in the low values of resistance which are recorded.

A further interesting example is that shown in Fig. 4. This diagram shows the resistance constant (C) curves for two vessels of equal total prismatic coefficients, one is Mr. Semple's model Dd,* and the other is Mr. Baker's model 97B.§ In each case the interference points have been calculated and are marked C for humps and T for hollows on the corresponding curves. Generally, there is no great difference between the corresponding points, but the main feature of the curves is the extensive hump at about 12 knots speed in Dd, and that at 10½ knots in 97B.

To ascertain whether these humps are due to bow interference, the calculation for such interference is investigated. The particulars of the models and the calculations are as follows:

Model No.	Dd.	97B.
Equivalent length	400.0 feet	400.0 feet
Equivalent beam	53.33 feet	52.26 feet
Equivalent draft	24.00 feet	23.23 feet
ϕt	0.811	0.812
ϕe	0.627	0.672
ϕr	0.648	0.578
Equivalent Le	103.6 feet	100.0 feet
Equivalent Lr	103.6 feet	100.0 feet
Thus $w = 3(1-\phi e)^2$	$= 3(1-0.627)^2$	$3(1-0.672)^2$
	$= 0.417$	$= 0.322$

$$V = 1.34 \sqrt{\frac{L \times w}{\frac{1}{2}}} = 1.34 \sqrt{\frac{103.6 \times .417}{\frac{1}{2}}} = 1.34 \sqrt{\frac{100 \times .322}{\frac{1}{2}}}$$

12.46 knots 10.75 knots

These points are marked distinctively on the corresponding curves and show that the large humps submerging the stern interference humps are undoubtedly due to the bow interference effects. As an aid to the graphical presentation of the bow effect and some guide as to its magnitude, there has been added what is thought to be the general run of the curve if the bow effects had been absent. The added resistance due to the bow effect would then be represented by the shaded areas in the diagram. It must be understood that the added resistance curves have not been experimentally determined—if such a thing was possible—and are suggested solely by the position of the hump and hollow points as previously obtained.

In the cases presented there is sufficient evidence to support the accuracy of the theory outlined in this, and the previous article.

In the third and concluding article, the author will attempt to correlate economical speeds and fineness using this theory as his basis of investigation.

STANDARD OIL MOTOR TANKER.—The Standard Oil Company's tanker *J. A. Moffett, Jr.*, which has just been converted from steam to Diesel drive at a cost of more than $500,000, ran her sea trials from New York last month.

The work of converting the *Moffett* was done by the Tietjen & Lang plant of the Todd Shipyards Corporation. Two M. A. N. Diesel engines manufactured by the Hooven, Owens, Rentschler Company, of Hamilton, Ohio, were installed. These will drive the vessel at a speed of eleven knots.

The *J. A. Moffett, Jr.*, is a twin-screw vessel of 15,000 deadweight tons. She is 499.2 feet long, has a beam of 68.1 feet and a depth of 30.5 feet. Built in 1921, the tanker is comparatively new but her conversion is further indication that American shipowners realize the many advantages of the motorship.

---

* Transactions, Institution of Naval Architects, 1919.
§ Transactions, Institution of Naval Architects, 1914.

Generated on 2024-09-12 15:00 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Questions and Answers for Operating Engineers

Practical information for marine engineers on the operation and maintenance of boilers, engines and auxiliaries

This department is maintained to help those who desire practical information regarding engine room problems or who are preparing to take examinations for a marine engineer's license. Readers are urged to send in questions. Inquiries bearing the name and address of the writer will be answered promptly by mail. If the question is of general interest the answer will also be published in an early issue of the magazine, although the identity of the writer will not be disclosed in doing so. Anonymous communications will not be considered.

Flash Point

Q.—Please define flash point.

A.—The flash point of an oil is that temperature at which the oil gives off a vapor such that it will ignite in the presence of an open flame. The flash point is really an indication of the vaporizing characteristic of the oil.

Use of Scrap Babbitt for Re-Babbitting

Q.—Is it good practice to use scrap babbitt for re-babbitting purposes?

A.—It may be done for line shaft boxes. However, it should not be done for crank bearings on account of the amount of abrasive present.

Heating Bearing Box for Re-Babbitting

Q.—Is it essential to heat the box when re-babbitting of a crank bearing is to be done?

A.—It is not advisable to run the babbitting into a cold box because the babbitting will not then unite properly with the box.

Diesel Engine Cylinder Lubricants

Q.—What are the qualities which a lubricant must possess for successful use in the Diesel cylinder?

A.—It must be capable of forming a film over the rubbing surfaces such as to prevent contact between the piston and cylinder. It must have a low coefficient of friction. It must be of sufficient body so as to seal clearances between piston and rings and thus prevent loss of compression. It should not burn at the cylinder temperatures existing during suction, exhaust or the latter part of the power stroke. In burning at the time of the high cylinder temperatures it should leave no carbon nor tarry deposits.

Repairing Grooved Crank Shaft

Q.—Can a crank shaft which has been grooved or cut at the bearings be repaired satisfactorily? If so how?

A.—A crank shaft represents a considerable part of the first cost of an engine. Accordingly, every effort should be made to repair any damage it has suffered rather than to replace it with a new one. Slight grooving may be removed by a file while the shaft is slowly turned by hand. When the damage is too serious to be remedied by this method, the shaft should be shipped to a good machine shop and a cut taken off of it at the journals. When this latter method is used the bearings must be re-babbitted to take the reduced diameter of shaft.

Taper Bolts

Q.—What are the reasons for fitting taper bolts?

A.—One of the principal reasons for the use of a taper bolt is to facilitate its withdrawal. Taper bolts are necessarily a tighter fit in the hole because of the tightening effects resulting from the setting up of the nuts.

Lighting an Oil Burner in a Cold Boiler

Q.—What precautions should be taken in lighting a burner when raising steam on a cold boiler?

A.—Circulate the oil until thoroughly heated; have the burners clean and never light more than one burner at a time when raising steam on a cold boiler; alternate the fires to different furnaces frequently so as to distribute the heat equally.

Air Chamber

Q.—On what part of a pump or its fittings is an air chamber placed? How does it act?

A.—An air vessel or chamber is placed on the discharge side of the pump. When the pump is delivering water some of it enters the air chamber and compresses the air in it. When the pressure lessens by the return stroke of the pump, the compressed air continues to force the water in a steady flow to the boiler.

Effect of Steam Pressure on Size of Safety Valve

Q.—Which boiler will require the larger safety valve, one carrying 200 pounds steam pressure or one carrying 150 pounds steam pressure with the same grate area?

A.—The boiler with the lower pressure of 150 pounds will require a larger safety valve than a 200-pound pressure boiler, each generating the same number of pounds of steam per hour, due to the increased volume per pound.

Boiler Stresses

Q.—What parts of a boiler are subjected to compressive stress, tensile stress and shearing stress?

A.—The nature of the various stresses throughout the parts of a Scotch boiler are enumerated below:

Part of Boiler	Kind of Stress
Shell plates	Tension
Front and back head plates	Equal tension and compression
Combustion chamber plates	Equal tension and compression
Head stay tubes and staybolts	Tension
Combustion chamber screw stays	Tension
Combustion chamber girder	Equal tension and compression
Combustion chamber girder bolts.	Tension
Furnaces	Equal tension and compression
Rivets	Shear
Plates and butt straps in front of rivets	Crushing
Tubes	Equal tension and compression
Nut and stay threads	Shear

When figuring stresses for parts under "tension or compression," the tension value only is considered.

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Wire Drawing of Steam

Q.—What is "wire drawing" when used in reference to steam?

A.—One of the greatest sources of loss in efficiency occurs when steam is compelled to pass through narrow orifices where the perimeter of such orifices is large compared with the area, as is the case at the steam ports of a cylinder. This is called "wire drawing" the steam and there is always a loss of pressure from this cause even when the area through which the steam passes is equal to that of the section of the pipe through which it has previously passed.

Failure of Boiler Feed

Q.—State several reasons why a boiler might not get its full feed supply.

A.—A boiler may not receive its full amount of feed through the feed pump not working properly, suction from hot well partly plugged, check valve on boiler hung up or stuck. One of a set of boilers may not get its right or proper amount of feed water if it has a higher pressure than the others, and again it might get too much if the pressure is lower than the others, but this can always be taken care of by regulating the check valves.

Tightness of Stuffing Box Glands

Q.—What can be said of the tightness of stuffing box glands for the cylinders of steam reciprocating engines?

A.—A. E. Seaton, in his "Manual of Marine Engineering," states that "glands should never be so tight that the rods are rubbed absolutely dry in passing through them. For the efficient working of the engine it is better that a faint leakage of vapor should pass out with the rod, as that is generally an indication of the packing being only tight enough so that the moist vapor lubricates the packing and keeps it soft, when of vegetable composition."

Expansion Joints

Q.—What is an expansion joint, for what purposes are they used, what precautions should be taken to insure against defeating the purpose for which they are intended and what material should be used in the working parts?

A.—An expansion joint is a stuffing box and gland fitted to various pipes to allow them to expand and contract and to allow for the vibration of the vessel and machines without causing fracture. Be sure that there is clearance enough in the joint to allow for free expansion and contraction, that the packing does not become too hardened and that the stuffing box is long enough to prevent the pipe from slipping out. The wearing surface of the male pipe in all expansion or slip joints for use in steam pipes should be of a non-corrosive material, such as copper or other suitable composition.

Insulating Materials for Uptakes

Q.—What is considered to be the most efficient insulating material for use on uptakes?

A.—So-called "eighty-five percent magnesia" is considered standard covering for uptakes. It is very efficient as an insulation. It is of light weight, easily handled and not subject to rapid deterioration. It is not damaged by moisture. It is a mixture of hydrated carbonate of magnesia and asbestos fiber, containing at least 85 percent of the former and at least 95 percent of both combined. It is generally fitted 3 inches in total thickness.

Asbestos blocks, made of layers of asbestos felt or asbestos fiber matted and bound together by a suitable fire resisting cement, make an efficient insulation for uptakes. They may be taken as next to 85 percent magnesia for uptake covering.

Important Points in Construction of a Diesel Engine

Q.—What are the most important points to be considered in the construction of a Diesel engine?

A.—For a given type of duty and brake horsepower the principal points to be considered in the design of a Diesel engine are as follows:

(a) Type of engine—vertical or horizontal; two or four cycle; type of scavenging; closed or open framing.

(b) Speed of engine in revolutions per minute—slow, medium or high speed.

(c) Mean piston speed and rated brake mean effective pressure.

(d) Independent or attached air compressors if used.

(e) Number and diameter of cylinders with their firing order and consequent balance of reciprocating parts.

(f) Type of fuel injection—air injection or airless; if airless, mechanical or injection chamber.

(g) Accessibility of parts for overhaul.

(h) Type of lubrication.

(i) Design of parts exposed to the heat of combustion, i.e., cylinder head and piston. Type of piston cooling if used.

(j) Coefficient of irregularity and speed variation when throwing off and on all or parts of full load.

(k) Overspeed governor for emergency fuel cut-off.

(l) So proportioning moving parts as to reduce vibration to a minimum and so locating the points of critical torsional speeds as far from the operating speed as is consistent with good design.

(m) Type of auxiliaries required—engine or motor driven—and their capacity to maintain correct temperature conditions throughout the changes of speed and load.

Heating Surface of a Scotch Boiler

Q.—What parts of a Scotch boiler may be rightfully included as heating surface?

A.—The following is quoted from "A Manual of Marine Engineering" by A. E. Seaton:

"Strictly speaking, all surfaces exposed to heat which are capable of absorbing, and their bodies of transmitting, that heat to the water or steam are heating surfaces; but technically only certain parts are reckoned as *effective* heating surface, and the aggregate of such surfaces is called the *total heating surface*. The surface of the upper half of the furnace or the part above the level of the fire-bars, that of the combustion chamber above the level of the bridges, and back plates, including the actual surface of the back-tube plates, are reckoned as the effective heating surface of furnaces and chambers, and are stated separately, chiefly on account of the metal forming them being three to four times the thickness of the tubes. The surface of the tubes measured externally—that is, the area obtained by multiplying the external circumference by the length *between* the tube plates, is called the *tube surface*.

"The Admiralty reckon tube surface by taking the area obtained by multiplying the external circumference by the length *over* the tube plates; and in reckoning the total heating surface, the surface of the back tube plates is omitted. The calculation is in this way simplified, and the *total heating surface* is practically the same as if calculated strictly, for the surface of the parts of the tubes covered by the plates is very nearly the same as that of the back tube plates.

"The *front* tube plates should be, and usually are, omitted in calculating the total heating surface, as they cannot be considered as effective.

"The *amount* of total heating surface must depend on the quantity and quality of the fuel burnt on the grates in a fixed time—that is, on the quantity of heat generated in a unit of time, and also on the quality of the surface, etc. But since a grate may at some time have to burn the best of fuel, and the engine to have the advantage, the total heating surface should be adequate for such an occasion. If, however, no increase in engine power is required, the damper must be partly closed or a portion of the grate bricked up; the latter is by far the better plan on economic grounds, as the brighter the fire the more effective is the combustion, and the consumption correspondingly decreased."

Generated on 2024-09-12 14:17 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Design of Hatch Davit

Q.—What is the correct way to design a hatch davit, such as is shown in Fig. 1, for striking down stores on board ship? Davit to be carrying a load of 500 pounds; the test load is 1,000 pounds. What stresses are the bearing and step subjected to? How can these be determined? If an electric hoist weighing 200 pounds is used for hoisting and lowering, must allowance be made for this extra weight? Please give method of design for davit when the vessel is on an even keel and when inclined at an angle of 10 degrees. What books give further information relative to the design of fittings, etc.?

A.—The design of a mechanical appliance, particularly when composed of several different members, is seldom a well defined or a simple process. This is partly because of the difficulty met in forecasting the character and severity of the service contemplated; partly because of wide variations shown in the practice in the field involved; and partly because of the limitations imposed by the ordinary mathematical methods of treatment.

The davit proposed in the question is intended for a working load of 500 pounds when used in striking down stores. The test under the load specified, viz., 1,000 pounds, is intended to establish the ability of the appliance, davit, bearing, step, etc., as a system to meet the requirements of service. Neither the speed of hoist nor the acceleration or deceleration of load to be anticipated in test or in service are specified. Nothing is stated as to the materials to be used. However, the sketch furnished indicates a davit made of pipe with welded head and heel. These comments are not intended as criticisms of the question. In fact, the question as worded is typical and the comments are made merely to emphasize certain statements made in the first paragraph above.

Accordingly, it is practice to design for working stresses much less than the ultimate strengths of the materials involved. The ratio in which the ultimate exceeds the designed working stress is termed the factor of safety. This factor then must be sufficient to insure that—

(a) the member will take no permanent set under service conditions;
(b) the member will not be deficient in "carrying strength" under repeated application and release of the load;
(c) the member will not fail due to sudden applications of load:
(d) the member will not fail due to excessive load, imperfect materials or any other unforeseen contingency.

In order to fix factors of safety or values of working stress, it is necessary to select the materials from which the several members are to be made. The sketch shows a hollow davit. Assume that lightness and simplicity are requirements, and that as a result, wrought iron pipe with wrought iron head and wrought steel foot, all galvanized, are selected for the davit and that brass is selected for the bearing and step. Brass is selected in order to avoid the bushings required with cast steel bearings. Assume that the tensile strength of the wrought iron pipe from which the davit is to be made is 30,000. It appears probable that in service the davit and supports will be subjected to sudden deceleration of load and that no great care will be exercised in its use. However, it will not be subjected to repeated and alternating stresses as ordinarily understood. In view of this, a working stress for the davit of 7,000 to 8,000 pounds per square inch is suggested. The bearing and step are small non-portable fittings. An excess of material is not a serious matter, so that a working stress of 3,000 pounds per square inch may be accepted.

The Davit

Fig. 2 shows the davit inclined 10 degrees from the vertial with the approximate lines of action of load, down haul, and

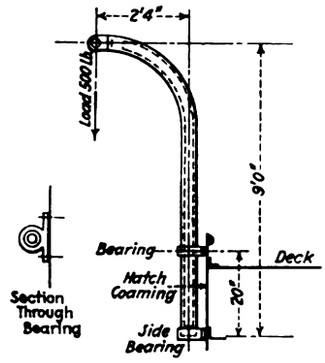


Fig. 1

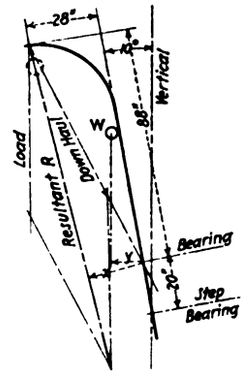


Fig. 2

resultant indicated. The locations of the bearings are also indicated. The davit is subjected to a bending moment equal to the resultant R of the load and down haul (including friction) multiplied by the distance X from the center of the bearing measured perpendicularly to the line of action of the resultant R. It is also subjected to the bending moment due to the weight of the position above the bearing acting along the dotted line through W about a lever y. Lastly, it is subject to a direct pressure equal to the sum of R and W multiplied by cos 10°. If, then, f be the working stress in the davit, A be the area of the metal in the davit cross section and Z be the modulus of the section,

$$f = \frac{Rx + Wy}{Z} + \frac{(R + W)\cos 10^\circ}{A}$$

$Z = \frac{I}{r}$ or moment of inertia of davit cross section divided by the distance to the outermost fibre (radius to outside of pipe). It is then possible to rearrange and solve the above equation for pipe diameters. However, it is believed simpler to assume several sizes of pipe in both extra strong and double extra strong types because the tables of properties in the National Tube Company's handbook can

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

then be used in picking out values of Z, A and weight per foot. Curves of stress and weight per foot can then be plotted and the selection of size made with all these data available.

Proceeding then in the way just suggested, the load, Fig. 2, is 500 pounds. To maintain equilibrium this must be balanced by a 500-pound pull in the down haul. To raise a weight an allowance of from 40 to 50 percent must be made for friction in the pulley and rope. It has been assumed for simplicity that the down haul runs to a cleat so located that its line of action passes through the center of the bearing. The resultant R of load and down haul may then be found graphically as indicated in Fig. 2, it being noted that it passes through the eye in the davit head; R = 970, an allowance for friction of say 50 percent, brings it up to 1455 pounds.

The value of X is also determined graphically from Fig. 2 as 21.5 inches.

Then moment $Rx = 1455 \times 21.5 = 31400$ inch pounds.

Assume W to be 140 pounds, including the weight of block and fittings. It acts at the center of gravity of the system approximately at the point marked W in Fig. 2. Y is also determined graphically as 11.5 inches. Then

$Wy = 140 \times 11.5 = 1610$ inch pounds.

$(R + W) \cos 10° = (1455 + 140) \times .985 = 1570$ pounds.

Consider them extra strong and double extra strong pipe having nominal sizes of 3, 3½ and 4 inches and 2½, 3 and 3½ inches, respectively, and prepare the following tables:

Note in the foregoing that the moment Wy and the direct pressure R + W are both very small relative to the moment Rx. It is good practice to ignore these effects. They have been included here to show their relative lack of importance.

EXTRA STRONG PIPE

Size, inches	3	3½	4	4½
Thickness, inches	0.3	0.318	0.337	0.355
Weight per foot, pounds	10.25	12.50	14.98	17.61
Area of metal in cross section	3.016	3.678	4.407	5.18
Value of modulus Z	2.22	3.14	4.271	5.62
Rx + Wy	33,010			
Rx + Wy / Z	14,900	10,520	7,740	5,880
(R + W) Cos 10° / A	522	428	357	304
Total stress f	15,422	10,948	8,097	6,184

DOUBLE EXTRA STRONG PIPE

Size, inches	2½	3	3½	4
Thickness, inches	.552	.600	.636	.674
Weight per foot, pounds	13.695	18.58	22.85	27.54
Area of metal in cross section	4.028	5.466	6.721	8.101
Value of modulus Z	1.997	3.424	4.924	6.793
Rx + Wy	33,010			
Rx + Wy / Z	16,550	9,660	6,700	4,870
(R + W) Cos 10° / A	390	288	233	194
Total stress f	16,940	9,948	6,933	5,064

An examination of the curve sheet Fig. 3, shows that for stresses of 7,000 and 8,000 pounds per square inch we have the following:

Stress in lbs. per sq. inch	EXTRA STRONG Pipe Size	EXTRA STRONG Weight per ft.	DOUBLE EXTRA STRONG Pipe Size	DOUBLE EXTRA STRONG Weight per ft.
7,000	4½"	16.2	3½"	22.8
8,000	4"	14.9	3.3"	21.0

Four-inch extra strong pipe weighing 14.9 pounds per foot seems a reasonable selection. The outside diameter is 4½ inches.

An electric hoist, insofar as its weight of but 200 pounds is concerned, would have no appreciable effect upon the size of the davit provided the motor were located on the straight portion of the davit not far above the deck. However, if it were so geared that it could exert at low speed a very powerful down haul, it might be necessary to investigate it carefully.

The effect of designing for the even keel position of the davit would be to decrease the principal bending moment through a considerable decrease in the value of the leverage x.

The Davit Head

The davit head should be of wrought iron welded into the pipe at its upper end and worked so as to provide an eye to take a shackle pin.

The maximum total load on the pin is 1,500 pounds. The pin is in double shear and may be considered as close fitting. It is subjected to a bending moment at its point of fixity.

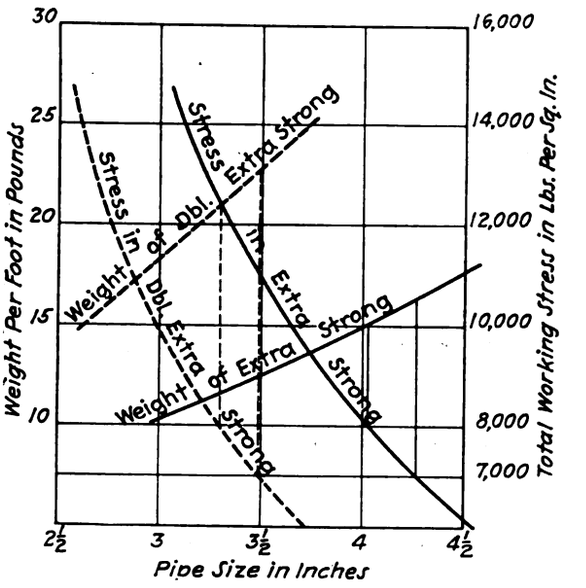


Fig. 3

Then from Unwin—

$$\tfrac{1}{2} P l = \frac{\pi}{32} f d^3$$

Here d = diameter of pin, l = length of shackle bearing, P = load on one end of pins = 750 pounds and f the unit stress = 6,000 pounds, to provide a reserve for corrosion

$$d^3 = \frac{\tfrac{1}{2} 750 l}{\frac{\pi}{32} \times 6000}$$

Assume l = 0.75 inch

$$d^3 = \frac{375 \times 0.75 \times 32}{3.1416 \times 6000}$$

$d^3 = 0.477$

$d = .78$ inch

For rivets in double shear the thickness of plate is about $\frac{d}{1.5}$.

The pin will not fill the hole as does a rivet; therefore, make the thickness of the davit head equal to or a little greater than the diameter of pin.

The radius to the outside of the metal surrounding the eye of the davit may be made about 1¼ inches.

The Bearing

The condition already considered in fixing the size of the davit is not necessarily that for which the bearing must be designed, because for this member it is not the condition under which it is most severely strained. Assume, then, that the down haul is acting parallel to the load, and that both act vertically even though the davit itself is inclined 10 degrees to the vertical. The downward force then is 500 × 2 × 1.5 equals 1500 pounds. Now resolve this force into

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

components parallel and perpendicular, respectively, to the axis of the davit. The component at the davit eye perpendicular to davit axis is equal to 1500 × sin 10° = 1500 × 0.1736 = 260.5 pounds. The component parallel to the

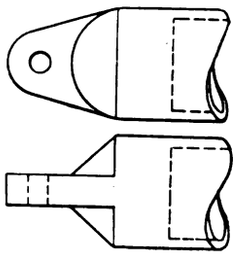


Fig. 4

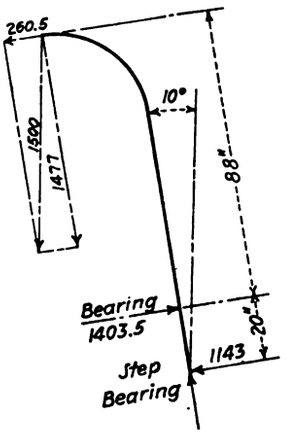


Fig. 5

davit axis is equal to 1500 × cos 10° = 1500 × 0.9848 = 1477 pounds. Then the component perpendicular to davit axis at step bearing = $260.5 \times \frac{88}{20} = 1143$ pounds. (See Fig. 5).

Then, the force tending to rupture the bearing = 260.5 + 1143 = 1403.5 pounds. This force is concentrated along the line of contact between davit and wearing surface of bearing as indicated in Fig. 6. This is similar in principle to a chain link or circular ring having a rectangular cross section. Several formulæ have been proposed for use in calculating the stresses in loaded rings. One of these developed by Mr. Wilson Worsdell and published by Mr. Robson in *Engineering*, May 6, 1910, has been investigated by comparison with the results of tests on

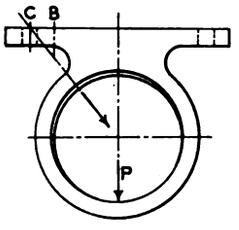


Fig. 6

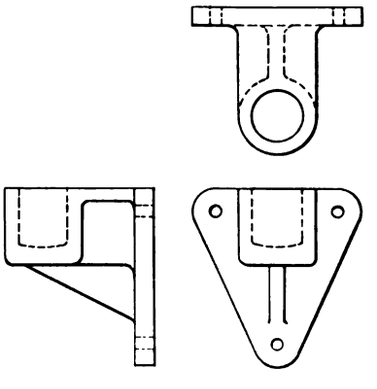


Fig. 7

a number of rings made at New York and Puget Sound Navy Yards. As a result of this investigation, Mr. Hilder, recently of the Bureau of Construction and Repair, Navy Department, Washington, D. C., suggested the following:

P = applied load in pounds.
M = bending moment in inch pounds.
f = unit stress in pounds per square inch.
R = mean radius of ring in inches.
t = thickness of rectangular section measured radially.
A = area of radial cross section in square inches.
Then for a rectangular cross section

$$f = \frac{2.64\,M}{A\,t}$$

For loading similar to loose pin or close fitting chain

$$M = \frac{P\,R}{5}$$

Using this formula, $M = \frac{1403.5 \times 2.45}{5} = 688$

(This assumes t = 0.40 inch for trial purposes.)

Then $A = \frac{2.64 \times 688}{0.5 \times 3000} = 1.21$ square inches

In the above equation, 3,000 pounds is the allowable unit working stress for the material contemplated, as previously assumed.

Reuleaux states that for slow moving journals and intermittent pressures, the ratio of the length of bearing to diameter of shaft may be 0.5. This bearing may be poorly lubricated and possibly not well alined; make length ¾ of the diameter of the davit or 3.37 inches. Then $t = \frac{1.21}{3.37}$ = 0.36 inch. Call this 0.4 inch. The value of t would be increased to nearly 0.6 inch if the load were considered definitely concentrated and the formula for M taken as $\frac{PR}{\pi}$ rather than $\frac{PR}{5}$.

The thickness of the pad should be such that it will not deform under service conditions. Assume that the rivets will hold and that the rupturing force, 1,403.5 pounds, acts perpendicular to the face of the pad. Then 702 pounds should be taken by each rivet and a bending moment will be set up in the pad. In order to secure a satisfactory bearing surface for the bolt or rivet head, the pad is made of constant thickness for a distance of about two and one-half rivet diameters from the end of the pad. Then the leverage for the bending moment referred to above is the distance between the center line of rivet at C (Fig. 6) and B the point where the fillet begins to thicken the pad. CB will be about 0.8 to 1 inch and the bending moment at C will be

$$702 \times 1 = 702 \text{ inch pounds}$$

Then stress in metal at $C = \frac{M}{Z} = \frac{702}{\frac{bd^2}{6}}$

Here b is width of pad minus diameter of rivet hole, say, 3.37—0.8=2.57 and d is thickness of pad (0.8 is assumed diameter of rivet).

$$\text{Then } d^2 = \frac{6}{2.57} \times \frac{702}{3000} = 0.547$$

$$\text{and } d = 0.547 = 0.74 \text{ inch}$$

It is assumed that the bearing is held in place by two rivets and that the pad is sufficiently thick to prevent bending. Then the action on the rivets is tension. Ordinary rivet material should stand satisfactorily under the conditions contemplated a stress of 8,000 pounds per square inch. However, the following should be noted:

It is possible for the load to be so applied as to come largely upon one rivet.

The rivets may be driven hot and thus develop an initial tension on cooling, due to contraction.

Take three cases:

(a) When the load is evenly distributed between the two rivets.

Then each rivet takes 702 pounds and area $= \frac{702}{8000} = 0.088$

$$d = 2\sqrt{\frac{0.088}{\pi}} = 0.33 \text{ inch.}$$

(b) When the load acts at an angle directly through one rivet. Assume this to be an angle of about 45 degrees.

Generated on 2024-09-12 14:55 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Then the two components, one acting along the pad and the other perpendicularly thereto are each $1403.5 \times \sin 45° = 993$ pounds. The most strained rivet is then subjected to shear and tension of $\frac{993}{2} = 496$ pounds and 993 pounds, respectively.

Then the combined shear and tension equals

$$\frac{993}{2} + \sqrt{993^2 + 496^2}$$

$$= 496 + 1110 = 1606 \text{ pounds}$$

If 8000 pounds be accepted as the working stress,

$$\text{area} = \frac{1606}{8000} = 0.201$$

$$d = 2\sqrt{\frac{0.201}{\pi}} = 0.506 \text{ inch.}$$

(c) When the load acts parallel to the face of the pad, there is a shear in each of the rivets equal to $\frac{1403.5}{2} = 702$ pounds.

There is in addition a bending moment equal to 1403.5 multiplied by the distance from the face of the hatch coaming, say, 3¾ inches. Moment $= 1403.5 \times 3.75 = 5260$ inch pounds.

Assume a rivet diameter of 0.6 inch.

The shear in pounds per square inch on one rivet $= \frac{702}{3^2\pi} = 2480$.

The two rivets acting together have a moment of inertia of $2 \times 3^2 A$, in which A is the area of cross section of one rivet, in this case 0.283 square inch, and 6 inches the distance between the two rivets.

Then $I = 2 \times 9 \times 0.283 = 5.09$ and the section modulus $= \frac{5.09}{3.3} = 1.54$.

Then stress per square inch due to bending moment $= \frac{5260}{1.54} = 3420$.

$$\text{The combined stress} = \frac{3420}{2} + \sqrt{3420^2 + 2480^2}$$

$$= 1710 + 4220 = 5930$$

This is rather low. Probably 9/16-inch rivets could be used.

The Foot Step

This should be made of steel welded into the lower end of the davit. It is subject to a lateral thrust of 1,143 pounds and to a load along the axis of the davit of 1,477 pounds.

Assuming a working unit load in shear of 6,400 pounds per square inch (about 80 percent of the allowed working stress in tension) the area of cross section in order to resist the lateral thrust must be

$$r^2 = \frac{1143}{6400\pi} = 0.0568$$

and $r = 0.24$ and diameter $= 0.48$ inch.

The foot step must also have sufficient area so that the unit pressure due to a load of 1,477 pounds will not be excessive. Unwin gives for a wrought iron step working on gun metal when speed of rotation is low, an allowable pressure of 700 pounds per square inch. If this be accepted the area of the foot step required would be

$$\pi r^2 = \frac{1477}{700} = 2.11$$

$$r = \sqrt{\frac{2.11}{\pi}} = 0.82 \text{ inch}$$

Then diameter $= 1.64$ inches (accept this because it is the more severe of the two requirements). The depth may be made $1\frac{1}{4} \times$ diameter.

The Step Bearing

This member must be proportioned to take the downward component parallel to the axis of the davit, see Fig. 5, and equal to 1,477 pounds. It must also be able to take the component perpendicular to the davit axis but acting in the direction opposite to that shown in Fig. 6 at P, when the davit is reversed in position and the ship heeled in a direction opposite to that shown in sketch. This is a smaller and more compact member than the main bearing. Owing to the manner in which it is necessary to set the socket out from the face of the hatch coaming in order to secure proper clearance for the davit, it is necessary to work webs for both lateral and vertical support. The resulting casting does not lend itself readily to even the crude mathematical methods used in the foregoing. It is suggested that the pad be made of about 80 percent of the thickness of that of the main bearing pads. The thickness of the metal forming the socket may be about ½ inch, and the webs supporting it the same.

Three rivets are shown in order to take the tilting tendencies anticipated when the davit is in use. The modulus of resistance thus provided must be sufficient for the moment due to the downward thrust $1477 \times 3.75 = 5540$ inch pounds.

$$\text{The shear in each rivet} = \frac{1477}{3} = 493 \text{ pounds.}$$

Then assume a rivet diameter of 7/16 inch. If the shear is unevenly distributed over all three rivets, the unit stress resulting is $\frac{493}{0.218^2\pi} = 3300$ pounds

Assuming that rivets are 4.5 inches apart vertically, their modulus is 1.17.

$$\text{Then stress} = \frac{5540}{1.17} = 4730 \text{ pounds per square inch.}$$

Then combined stress

$$= \frac{4730}{2} + \sqrt{4730^2 + 330^2}$$

$$= 8130 \text{ pounds per square inch}$$

This appears satisfactory.

No attempt has been made to refine the results obtained by allowing for the effect of small fillets, machine work, etc. Nor have the dimensions been reduced to the nearest sixteenth inch as would be done in practice. The aim has been to describe processes with the reasons therefor.

The methods described are those which the writer would follow in solving a problem such as that proposed. However, they are not the only possible methods. Moreover, it is probable that designers regularly engaged upon such problems would eliminate some of the work and secure more uniform results by utilizing empirical formulæ and factors based upon experience. Probably small castings and the riveting for them are seldom made the subject of calculation but are designed by comparison with similar castings already shown to be satisfactory in service.

The writer is not acquainted with any publication which is devoted to the design of ship fittings. In order to attain proficiency in this field of design a good ground work in the basic principles of mechanics of engineering and strength of materials is essential. This should be supplemented by a working acquaintance with some standard publications on machine design, together with one or two good engineering handbooks for the sake of the large amount of labor saving data contained therein.

The following is a list of books which the writer finds of value:

Mechanics of Engineering, by I. P. Church, published by John Wiley & Sons, New York.

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Strength of Materials, by Morley, published by Longmans, Green & Co., 4th Avenue and 30th Street, New York.
Machine Design, Hoists, Derricks, Cranes, by H. D. Hess, published by J. B. Lippincott Company of Philadelphia.
The Constructor, a handbook of machine design, by F. Reuleaux (translated by H. H. Supples).
The Elements of Machine Design, by W. C. Unwin, published by Longmans, Green & Co., London, New York, and Bombay.
The Naval Constructor, by G. Simpson, published by D. Van Nostrand Company, New York.
National Pipe Standards, published by National Tube Company, Pittsburgh, Pa.
Pocket Companion, published by Carnegie Steel Company, Pittsburgh, Pa.
The Mechanical Engineer's Pocket Book, by William Kent, published by John Wiley & Sons, New York.

Abstracts of Articles Translated from the Foreign Press

Comparison of Steam and Diesel Tug Boats

A series of carefully conducted towing experiments were carried out with steam and Diesel tow boats on the Rhine. The object was to investigate the efficiency of the two types. The vessels used in the experiments had horsepowers ranging from 200 to 400. The Diesel engines were of Deutzer-Gasmotoren-Fabrik type, four cycle, solid injection engines. These engines showed a mechanical efficiency of 84 percent. A further 4 percent loss was assumed in the shaft bearings, etc., thus we have the shaft horsepower equal to 80 percent of the indicated horsepower of the engine, the shaft horsepower for the steam engine being put at 70 percent of the indicated horsepower. The Diesel tow boats in question had bronze propellers fitted while the steam tug had a cast iron propeller. The horsepowers were as follows:

R-Diesel, 200 horsepower Diesel engine, single screw.
Thyssen III, 300 horsepower Diesel engine, single screw.
Die Maas, 350 horsepower steam engine, single screw.

STEAM TOW BOAT *Die Maas*

Built in 1924. Length, 28 meters; beam, 6 meters; draft, with 45 tons coal, 1.78 meters. The engine is a triple expansion with cylinder diameters 290, 470 and 760 millimeters and a stroke of 380 millimeters, developing 350 horsepower at 185 revolutions per minute. The propeller diameter is 1.85 meters with a pitch of 1.8 meters. The towing trials in 1924 and 1927 gave practically identical results, the latter trial is as follows: Towing 2 barges upstream at a speed of 3.92 meters per second through the water the tow rope resistance was 2,965 kilograms, the resistance of the vessel 325 kilograms, giving a total propeller thrust of 3,290 kilograms, or 132.4 effective horsepower. The indicated horsepower of the engine during the trial was 363 at 186 revolutions per minute. We thus have the shaft horsepower equal to 363—109=254 and the propeller efficiency $= \frac{132.4 \times 100}{254} = 52.2$ percent. Full details are given of yearly towing voyages up and down stream, running expenses, earnings, etc. The vessel cost 135,000 marks to build. Taking into account depreciation, etc., this vessel is running at a yearly loss of 13,590 marks. These are the actual conditions in the steam towing business on the Rhine.

DIESEL TOW BOAT *R-Diesel*

This vessel was built in 1926, and has a length of 16 meters; beam, 5 meters; draft, 1.10 meters. The propeller diameter is 1.55 meters and the pitch 1.10 meters. At 290 revolutions per minute the motor brake horsepower is 200. The tow rope resistance at a speed of 3.07 meters per second through the water indicated 2,335 kilograms, the vessel's resistance being 190 kilograms, giving a total propeller thrust of 2,535 kilograms or 103 effective horsepower. The engine developed 264 horsepower at 305 revolutions per minute, therefore the shaft horsepower is 211, assuming 80 percent efficiency as outlined above.

$$\text{Propulsive efficiency} = \frac{103 \times 100}{211} = 48.8 \text{ percent.}$$

The propeller thrust was found to be too high. A later trial with a propeller of 1.60 meters diameter and 1.10 meters pitch gave a propulsive efficiency of 52.5 percent.

DIESEL TOW BOAT *Thyssen III*

The length of this boat is 19.28 meters; beam, 5.15 meters; draft with 7 tons of fuel oil, 1.75 meters. The engine is a four cycle, six cylinder Deutz developing 300 horsepower. This engine is direct reversible, while that for the *R-Diesel* has a reversing gear installed. The engine cylinder diameter is 280 millimeters; stroke, 500 millimeters. The vessel is fitted with a bronze propeller of variable pitch of 0.95 meters, contrary to the propeller of the above mentioned vessels which have constant pitch.

During the trial the engine developed 316 indicated horsepower at 297 revolutions per minute, giving a shaft horsepower of 252.8. The tow rope resistance was 2,750 kilograms, the vessels resistance, 330 kilograms and the total propeller thrust, 3,080 kilograms, corresponding to 132 effective horsepower (equal to that of *Die Maas*).

$$\text{Propulsive efficiency} = \frac{132 \times 100}{252.8} = 52 \text{ percent.}$$

On a later trial at full engine turning moment, the revolutions per minute being increased to 327, a speed through the water of 3.38 meters per second was obtained. The tow rope resistance increased from 2,750 to 3,400 kilograms; the vessel's resistance, 380 kilograms, or total propeller thrust, 3,780 kilograms; indicated horsepower, 400, or 320 shaft horsepower; effective horsepower, 170.

$$\text{Propulsive efficiency} = \frac{170 \times 100}{320} = 53 \text{ percent.}$$

When this example is worked out similar to that of the steam tug it shows a yearly profit of 9,600 marks, corresponding to 7.5 percent interest on the investment. This clearly proves the superiority of the Diesel tug. Further particulars are given in the following table:

	Displacement of towed barge *Tons*	H.P.	Tons towed per horsepower	Cost of construction of tug boat *Marks*	Cost of construction per tons towed *Marks*
R-Diesel	1,200	215	5.5	80,000	66.7
Thyssen III	1,800	330	5.5	125,000	69.5
Die Maas	1,400	255	5.5	135,000	96.5

—*Werft-Reederei-Hafen*, October 7, 1927. 3 pages.

New High Speed Diesel Engine

Many efforts have been made in Germany to develop high speed Diesel engines. One of the most interesting solutions is the Acro motor. The patent for this engine has been purchased by Robert Bosch, Stuttgart. The fact that the patent is in the hands of a firm of such repute goes far to predict the success of this engine. The trials here to be described took place in the laboratories of this firm.

The engine works on the four stroke principle. The free space between the cylinder walls and the piston consists of four distinct zones.

1. A cavity or compression chamber in the piston top.
2. A passage of Venturi form which connects the compression chamber with the dead space on top of the piston.
3. The dead space on top of the piston.
4. A small tube communicating the compression chamber with the Venturi passage.

Generated on 2024-09-12 14:53 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Fuel is injected under pressure down the Venturi passage.

The trials were carried out with a motor of one cylinder only of the following dimensions: diameter, 4.93 inches; stroke, 7.1 inches; revolutions per minute, 800; volume swept, 135 cubic inches.

The cubic capacities of the spaces outlined above are as follows:

(a) Compression chamber 5.98 cubic inches = 70 percent
(b) Combustion chamber 0.61 cubic inch = 7 percent
(c) Dead space 1.95 cubic inches = 23 percent
Total capacity of spaces = 8.54.
Passage between compression chamber and Venturi passage = 0.188 square inch.

The construction of the motor is analogous to that of an airless injection engine. The fuel is injected down the Venturi passage, the injection valve closes 15 degrees after top dead center. First of all an effort was made to determine the difference in pressure between the compression chamber and the Venturi passage. These spaces are connected by a tube of very small diameter. The pressure in the compression chamber rises when the piston moves up and reaches its maximum about 20 degrees before top dead center. It then falls off until top dead center is reached; violent oscillations take place at this point.

In a second series of experiments it was attempted to determine the variation, in temperature, at different points of the cylinder and in the compression chamber.

The variation in temperature at each of eight points measured as the piston moves down (the distances are in centimeters from top of piston) was registered by means of thermocouples. The highest temperatures were registered at the points 0, 10, 20 and 30—these points being in the Venturi passage.

The injection of fuel ceases after the piston has moved 15 degrees from top dead center. The combustion takes place in the Venturi passage. The air contained in the compression chamber, during the compression stroke forms a reserve of fresh air which tends to escape to the space of lower pressure. During the combustion, this air passes by the Venturi passage and supplies to the combustion a constantly renewed quantity of air, at the same time driving the products of combustion into the dead space on top of the piston.

Thus it is seen that the phenomena of combustion is very different from that of the anti-chamber motors; the principle of these consists in burning a small part of the fuel in a special cavity or anti-chamber, and thus obtaining a higher pressure that forces the principal charge down in the combustion chamber.

During trials with reduced charge it was observed that the combustion still took place in the Venturi passage, but the temperatures at 0 and 10 were much lower.

The trials carried out with the object of determining the influence of piston speed have shown that in all cases the hot zone is confined to a length of about 1.18 inches, when the piston has descended 0.315 inch. The maximum temperatures obtained are not very different at 400 and 800 revolutions per minute. They are higher at 600 revolutions per minute.

Revolutions per minute	200	400	600	800
Mean pressure in kg.	3.3	4.78	5.77	5.41
Maximum temperature, degrees centigrade	1,350	1,300	1,650	1,370

(After piston has moved 0.315 inch.)

Can the conclusion be drawn that the speed of combustion is proportional to the speed of rotation, and that it is possible to burn the same quantity of fuel in a time space corresponding to the same displacement of piston? If so, the speed can still be augmented. The point is still obscure, but so far there is nothing to indicate that this is not the case. The motor turned at all revolutions from 200 to 800 and at all charges, absolutely regularly and without smoke.

If the speed of combustion is proportional to the speed of rotation, the maximum charge possible (without smoke) should practically be the same at all speeds.

The trials have given the following results:

Revolutions	200	400	600	800
Mean pressure (kg.)	6.82	7.10	6.54	8.40

The differences are small. It was also noted that the differences in fuel consumption were small.

For the combustion to be faster, it is necessary that the air supply should be greater. The experiences concerning the variation in pressures indicate that this is the case. The experiences, unfortunately, are limited to one part of the compression period. When the piston approaches top dead center, the vibrations of the diaphragm, used to read the variations in pressure, makes it impossible to get the readings.

At 20 degrees before top dead center the following differences in pressures have been observed:

Revolutions	200	400	600	800
Excess pressure at compression chamber with regard to dead space at top of piston in grams	211	281	773	1,760

If it is admitted that the differences in speed are proportional to the square root of the differences in pressure, the following results are obtained: (Taking 800 revolutions per minute as unity)

Ratios of speeds of rotation	0.25	0.38	0.68	1
	0.34	0.40	0.68	1

That the speed of combustion adjusts itself automatically to the speed of rotation is explained by the fact that the speed of air through the Venturi passage is in itself practically proportional to the speed of rotation of the motor. It can truly be said that this type of engine is very flexible.

To get an idea of the speed of flow of air, one can refer to the excess pressure 1,200 grams in the compression chamber over that in the dead space at top of piston at 800 revolutions per minute and 20 degrees after the top dead center. At 700 degrees centigrade and with stable conditions this is equivalent to a speed of 500 feet per second.

The speed at 300 revolutions per minute is about 200 feet per second.

CONCLUSIONS

The two essential characteristics of the motor are:

(1) The restriction of the combustion to a very small part of the compression chamber and the spontaneous separation of the burned gases and the fresh air supply. This results in very favorable conditions for a good combustion.

(2) The automatic adjustment of the speed of combustion to speed of rotation makes high speeds possible.—*Bulletin Technique du Bureau Veritas*, Paris. Three pages, two diagrams.

PERSONAL MENTION

S. E. DUFF, formerly assistant to W. P. Bannister, assistant operating manager of the Pacific Steamship Company, Seattle, Wash., has been appointed terminal manager of the Dollar Steamship Line, at New York, with headquarters at Pier 9, Jersey City, N. J.

L. R. POWELL, JR., of Baltimore, Md., was recently elected president of the Baltimore Steam Packet Company (Old Bay Line), Baltimore, Md., succeeding the late S. Davies Warfield. Henry M. Warfield was elected a director to fill the vacancy caused by the death of his brother. L. H. Windholz, president and general manager of the

Generated on 2024-09-12 14:20 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

D. Pender Grocery Company of Norfolk, also was elected a director, and J. D. Downes, formerly assistant treasurer of the company, was appointed treasurer.

J. B. FRISBIE, who for many years has been connected with foreign commerce work, has been appointed assistant manager of the foreign commerce department of the United States Chamber of Commerce. Mr. Frisbie will assume his duties about January 1.

CAPTAIN E. L. MCNOBLE, veteran Seattle shipping man, has resigned from the Admiral Line, Seattle, Wash., and accepted the position of traffic manager for the Western Transportation Company of Portland, Oregon. Captain McNoble had been port captain of the Admiral Line.

FRED A. HOOPER, agent of the American-Hawaiian Steamship Company at Los Angeles, Cal., has been appointed president of the Los Angeles Steamship Agents' Association. Other officers are: E. A. Mills, Crescent Wharf and Warehouse Company, vice president, and James Kennedy, Los Angeles Steamship Company, secretary and treasurer.

PROFESSOR WILLIAM HOVGAARD, head of the naval construction course of the Massachusetts Institute of Technology, Cambridge, Mass., was recently decorated by King Christian the Tenth of Denmark with the "Kommandorkorset of Dannebrog," which is one of the highest orders awarded in Denmark for distinguished service. The presentation was made by George Beck, Danish Consul General to this country, on the occasion of a dinner tendered Professor Hovgaard in the Army and Navy Club of America, to celebrate his 70th birthday. The dinner was given by the Danish Officers' Club, a club composed of officers of the American or Danish Army or Navy, all members being of Danish extraction. Professor Hovgaard has been an outstanding figure in the development of naval construction in this country and his papers before the Society of Naval Architects and Marine Engineers, and his books on warship construction have been of the utmost importance in this field. Professor Hovgaard graduated from the Royal Danish Naval Academy in 1879 and joined the Danish Navy as a lieutenant. In 1882 he was a member of a scientific expedition to the Virgin Islands to observe the passage of the planet Venus. He spent the next three years in England studying naval architecture. Upon his return to Denmark he joined the shipbuilding firm of Burmeister and Wain as director. During this period he designed and constructed a number of special ships as icebreakers, large ferries and the Russian Emperor's yacht *Polar Star*. In 1898 he was promoted to the grade of captain in the Danish Navy. In 1901 the captain was sent on a special mission to this country in order to study submarine construction. The same year he accepted the chair of naval construction at the Massachusetts Institute of Technology. Besides being a naval architect of note and an instructor of rare ability, Professor Hovgaard's services in a consulting capacity have often been asked by the United States Navy Department, in which department he served as a captain during the war. The professor was a member of special committees investigating the *Titanic* and *Shenandoah* disasters. In 1917 he was awarded the gold medal of the Institution of Naval Architects.

Prof. William Hovgaard

MASON F. GRYMES, president of the New York Marine Company, was elected president of the Jersey Marine Club by unanimous vote at the recent luncheon meeting in the Grand Hotel, Hoboken. Captain P. G. Schuman was appointed first vice president; H. E. Wilson, second vice president, and Fred L. Broad was re-elected secretary and treasurer.

CAPTAIN JOHN D. WAINWRIGHT, in charge of the branch office of the United States Hydrographic Bureau, has been appointed assistant commandant of the fourth naval district under Admiral J. L. Latimer of the Philadelphia Navy Yard, succeeding Captain William N. Riddle, who has been ordered in command of the *U. S. S. Raleigh*. Commander J. W. Rieger will succeed Captain Wainwright.

HANS HOLZWARTH, inventor of the Holzwarth gas turbine, recently received the honorary degree of Doctor of Engineering at the University of Stuttgart, Stuttgart, Germany, in recognition of his fundamental accomplishment in the development of combustion engines by the creation of this type machine. The first Holzworth gas turbine has been placed in the National Deutsche Museum in Munich and given a place of honor close to the first Diesel engine.

C. B. WARREN, assistant manager of Alexander and Baldwin, Ltd., northwest agent for the Matson Navigation Company (San Francisco, Cal.), has been elected president of the Maritime Association of Seattle. Other officers elected include: Captain C. J. Stewart, operating manager of the Thorndyke Shipping Company, Seattle, first vice president; Captain J. Howard Payne, president of the Sound Ferry Lines, Edmunds, Wash., second vice president; Arthur Wuthenow of the Coastwise Steamship and Barge Company, Inc., Seattle, secretary and treasurer.

HOWARD FISHER, formerly general manager of the Kensington shipyard of William Cramp and Sons Ship and Engine Building Company, Philadelphia, Pa., and Louis P. Maier, formerly assistant general manager of the Kensington yard, have opened an office under the name of Fisher & Maier in the Forrest Building at 119 South Fourth street, Philadelphia, Pa. Both Mr. Fisher and Mr. Maier served apprenticeships with the Cramp Company in the shops and drawing rooms and have had thirty years experience in all branches of shipbuilding and repair work. The new firm will act as surveyors, designers and supervisors of new and repair work in the marine field.

OBITUARY

CAPTAIN FRANCIS SALTUS VAN BOSKERCK, commandant of the Norfolk division of the United States Coast Guard, died recently, following a heart attack.

CAPTAIN DAVID D. DEMING, veteran Hudson river captain, died at Albany, New York, recently. Captain Deming had been in command of the Hudson River day liner *Hendrick Hudson*. He was 70 years of age.

GEORGE L. TAYLOR, port engineer of the Consolidated Navigation Company of Baltimore, Md., died recently at his home in Dundalk, Md. Mr. Taylor was formerly assistant manager of the Maryland Steel Company and later was hull inspector for the Steamboat Inspection Service.

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes of Interest in All Branches of the Marine Industries

Completed Plans for Two Ships for Panama S.S. Co. Now in Hands of Officials

PLANS and specifications covering two passenger ships for the Panama Steamship Company, New York, have been completed by the firm of Cox and Stevens, naval architects, New York.

It is understood that these ships will be fitted with geared turbines, driving twin screws. Steam will be supplied by Babcock and Wilcox watertube boilers at 300 pounds per square inch pressure and 150 degrees superheat. Auxiliaries will be electrically driven and current will be supplied by Diesel engines, connected to generators.

The plans are now under consideration by the officials of the company and it is expected that they will be issued for tentative proposals within a short time.

Bids Received and Opened Recently for Two Colliers by Berwind-White Company

BIDS for two colliers for the Berwind-White Coal Mine Company, 1 Broadway, New York City, were received and opened at the office of the president of the company on Thursday, December 22. Plans and specifications for the work were drawn by Theodore E. Ferris, 30 Church street, New York.

The colliers will have a length of 391 feet, beam of 50 feet and a load draft of 23 feet 6 inches. They will each have a capacity of 6,500 tons deadweight. The vessels will be propelled by geared turbines, developing about 3,000 shaft horsepower. Steam will be supplied by Babcock and Wilcox watertube boilers at 400 pounds per square inch pressure. The boilers will be fitted with pulverized coal-burning equipment.

The bids will go before the board of directors of the company for consideration and it is expected that further information will be available shortly.

Plans for Philadelphia and Reading R.R. Diesel Tugboat Soon to Be Issued

IT is understood that plans and specifications for the construction of a Diesel tug boat for the Philadelphia and Reading Railroad, Philadelphia, Pa., have been completed and will shortly be issued to shipyards for bids. The boat is to be equipped with a 500-horsepower Diesel engine, the make of which has not as yet been determined. Further information regarding this vessel will be available shortly.

Plans Being Drawn Up for One and Possibly More Colliers to Burn Pulverized Coal

IT is understood that inquiries are being made by coal companies, with offices in New York City, among shipyards for the construction of colliers in which pulverized coal-burning equipment will be installed. It is believed that specifications are being drawn by the Fore River plant of the Bethlehem Shipbuilding Corporation, Ltd., Quincy, Mass., for one of these boats for the Clinchfield Coal Company, New York.

It has also been learned that the Pocahontas Fuel Company, New York, is having plans and specifications prepared for the construction of two colliers and possibly more, which will be added to the fleet. These plans are being prepared at the American Brown Boveri Electric Corporation (New York Shipbuilding Corporation), Camden, N. J. The boilers on these colliers will be fitted to burn pulverized coal. No further details of the size or general particulars can be obtained at this time.

Ericsson Line May Build Passenger Steamer

INFORMATION has been received that plans are rapidly going forward at the offices of the Ericsson Line, Philadelphia, Pa., for the construction of a passenger steamer, which will be a sister ship of the one built at the Pusey and Jones yard, Wilmington, Del., about two years ago. The plans for this type ship were developed by Cornell and Matthews, naval architects, for the Ericsson Line at Philadelphia.

The steamer will have a length overall of 230 feet; beam over guards, 45 feet; depth, molded, 15 feet 10 inches. She will have a guaranteed speed of 15 knots and will contain the latest improvements for efficient operation, as well as fine passenger accommodations.

Fletcher Yard Awarded Singer Company Power Barge Contract

A CONTRACT has been placed with the W. and A. Fletcher Company, Hoboken, N. J., for hull work on a power Diesel barge for the Singer Sewing Machine Company, Elizabeth, N. J., plans for which were prepared by Eads Johnson, naval architect, New York.

A contract has also been placed with the New London Ship and Engine Company, Groton, Conn., for one Diesel engine of about 340 brake-horsepower, which will be installed in the barge at the W. and A. Fletcher yard.

Bids for 16 Auxiliary Diesel Engines to Be Opened by Shipping Board January 11, 1928

TENDERS will be received and opened at the office of Captain R. D. Gatewood, manager of the maintenance and repair division of the United States Shipping Board, 45 Broadway, New York City, until 11.00 A. M., eastern standard time, January 11, 1928, for the construction of 16 auxiliary Diesel engines, which are to be used for driving generators, compressors and pumps in the forthcoming program of converting Shipping Board vessels to Diesel drive.

The engines will be of an approved type, suitable for marine use, for driving two-wire 240-volt direct current generators, rated at 150 kilowatts and 350 kilowatts. They are to be of the vertical two or four-cycle, have not less than three cylinders, short or medium stroke, medium speed, heavy duty, crosshead or trunk piston, non-reversible type, and thoroughly accessible, work on the full Diesel cycle, and preferably employ air for fuel atomization. When solid or mechanical injection engines are offered, they are to be guaranteed to be as reliable, require no more frequent overhaul, burn the same low quality fuel oils, be as flexible for varying grades of fuel and varying load conditions as the air injection type. It is strongly preferred that two-cycle engines have other than crank-case compression in order to insure efficient scavenging and conservation of lubricating oil. They are to conform to the latest requirements of the American Bureau of Shipping, United States Steamboat Inspection Service and the Rules and Instructions for the Inspection of Marine Machinery built for the United States Shipping Board, in so far as these rules will apply to this class of machinery.

Accessories Required

Each engine is to be furnished complete with all necessary accessories and mountings as follows:

Multi-stage injection air compressor, with interstage coolers; scavenging pumps; starting gear; fuel oil pumps; generator; generator base (shaft and bearings); governor of such design as to permit all engines to be operated satisfactorily in parallel; water-cooled exhaust manifolds; scavenging manifold; complete water cooling and forced feed lubrication systems; all piping and valves attached to engines and compressors for injection and starting air, fuel oil, lubricating oil, and cooling water; all necessary pressure gauges, thermometers, ladders and gratings at valve gear; injection air flasks; fly-wheel fitted for and with hand turning gear; wrenches, tools, special equipment and spare parts as specified, and lubricating oil pump and cooler.

Generated on 2024-09-12 14:20 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Defoe Boat Works Gets Order for 140-foot Diesel Yacht

A CONTRACT has recently been placed with the Defoe Boat and Motor Works, Bay City, Mich., for the construction of a 140-foot Diesel yacht. The design was prepared by B. D. Bowes, naval architect, Philadelphia, to the order of Mr. Fitkin, also of Philadelphia, Pa.

Plans Being Prepared for 214-Foot Steel Barge

PLANS and specifications for the construction of a steel wharf barge for Burlington, Iowa, are being prepared by the W. F. Schulz Engineering Company, Shrine building, Memphis, Tenn. This barge is to be 214 feet long, 45 feet wide and 6 feet 6 inches deep. The vessel is to be equipped with 20 watertight compartments. The barge house is of steel and will be 39 feet wide, 192 feet long and 12 feet clear height inside.

Yacht Contracts Placed with Herreshoff Yard

IT is understood that a contract has been placed by one of the Vanderbilt family with the Herreshoff Manufacturing Company, Bristol, R. I., for the construction of a 150-foot Diesel yacht. This boat was designed by the Purdy Boat Company, Inc., New York.

A contract was also placed with the Herreshoff yard recently for the construction of a 75-foot cruising speed boat for one of the Morgans.

Newport News Shipbuilding Company to Build 263 Foot Turbo-Electric Yacht

INFORMATION has been received that a contract is about to be signed with the Newport News Shipbuilding and Drydock Company, Newport News, Va., for the construction of a 263-foot turbo-electric yacht. This yacht was designed by Theodore D. Wells, naval architect, 33 Rector street, New York City, to the order of George F. Baker, Jr., New York. Bids were received from six shipyards and were opened on December 14. Of the proposals submitted, the Newport News Shipbuilding and Drydock Company was low.

Diesel Propelling Machinery to Be Installed on Towboat John C. Irwin

SEALED proposals will be received by the United States Engineer Office, Nashville, Tenn., until 11:00 A. M., central time, January 9, 1928, and then publicly opened, for furnishing all labor and materials and performing all work for providing and installing new machinery on the towboat *John C. Irwin*. The towboat is moored at Lock A, Fox Bluff, Tenn., a point on the Cumberland river, 40 miles below Nashville, and on the Tennessee Central Railway. Prospective bidders may inspect the boat at that point. The contractor will be required to commence work under this contract after the award within 10 days after the delivery of the vessel to his plant and to complete it within 120 calendar days after date of delivery of the vessel to his plant.

The propelling engine to be installed is to be of the full Diesel type, direct reversible, with ignition accomplished solely by heat of compression and developing 150 brake horsepower at nominal rated revolutions per minute. The engine should be the product of American manufacture, by a firm regularly engaged in the manufacture of Diesel engines, and is to be of the vertical, four-cycle air injection type, with a piston speed not to exceed 825 feet per minute and a brake mean effective pressure not to exceed 80 pounds per square inch, or a four-cycle mechanical injection type with a piston speed not to exceed 825 feet per minute and a brake mean effective pressure not to exceed 85 pounds per square inch. Further information may be obtained on application.

Contract for Steel Pontoons Awarded to Biggs Boiler Works

A CONTRACT for the construction of seven steel pontoons has been awarded by the United States Engineer Office, Cincinnati, Ohio, to the Biggs Boiler Works, 1007 Bank street, Akron, Ohio, at a price of $11,711. The same office awarded a contract to the Petroleum Iron Works of Ohio, Sharon, Pa., for the construction of 25 sections of riveted pipe, at a price of $2,925. Bids for the pontoons and pipe were received at Cincinnati on October 25.

Moore Drydock Company Awarded Repair Contract on S.S. Manoa

THE 6,806 gross-ton steamship *Manoa* of the Matson Navigation Company, San Francisco, has been drydocked at the plant of the Moore Drydock Company, Oakland, Cal., for a general overhauling. Her cabin accommodations will be completely changed and betterments will be made to the ship throughout.

The *Maui* and *Matsonia* of the same line are now at the yard of the Bethlehem Shipbuilding Corporation and during the period of repairs to the three vessels, the *Malolo* and the *Wilhelmina* will be depended upon to handle the company's passenger traffic to and from Honolulu.

Great Lakes Engineering Works to Build Automobile Ferry

A CONTRACT for the construction of a new ferryboat has been awarded to the Great Lakes Engineering Works, River Rouge, Mich., by the State Ferry Line, which now operates one boat every hour and a half between the upper and lower Peninsula across the straits of Mackinac.

To Carry 60 Automobiles

The new boat will be similar in design to those now used except that it will have a capacity for 60 automobiles instead of 50. She will be of steel construction and will be able to plow through at least eight inches of ice. The new three-decker is to be delivered June 1, thus augmenting the service before the annual Summer rush to the Northern Peninsula. Work of building the new steamer, which is to be 202 feet long, is expected to start immediately.

U. S. Engineers at Galveston Ask Proposals for Tugboat

SEALED proposals were received by the United States Engineer Office, Galveston, Tex., on December 17, 1927, and opened, for the construction of one steel tugboat. This tug is to have a length of 65 feet 6 inches. Further information may be obtained on application.

West Coast Firm May Fit Two Shipping Board Vessels to Carry Lime Stone

IT is understood that the proposal for the purchase of two Shipping Board vessels by a West Coast firm for carrying lime-stone may be revived. Specifications covering the necessary work of altering the two ships, the *Eastern Coast* and *Eastern Guide*, were prepared last spring by Frank S. Martin and Son, naval architects, 25 Broadway, New York, and bids were received at that time. The specifications were divided into three sections and proposals received on each one. The first and second were for general reconditioning and the third for fitting hoppers. It is believed that the bids submitted at that time will be used as a basis for awarding the work if arrangements for their purchase are completed with the Shipping Board satisfactorily.

Extensive Hull and Engine Work Required on S.S. Mexico

THE steamship *Mexico*, operated by the Ward Line (New York and Cuba Mail Steamship Company), New York, which was recently aground off Vera Cruz, was surveyed at the yards of the Robins Drydock and Repair Company, Brooklyn, by the firm of Frank S. Martin and Son, naval architects, New York. The grounding damage necessitated repairs to both the hull and engines. A contract for the work was awarded to the Robins' yard at a price of $27,357.

Alterations on S.S. William M. Tupper

A CONTRACT for alterations to the steamship *William M. Tupper*, which will provide increased passenger accommodations, has been awarded to the Lake Washington Shipyards at Houghton, Wash., on a bid of $8,950. Virtually a new deckhouse will be constructed. The work is to be completed in 40 days. Eight bids were received, the highest being $13,000.

Pontoon Bids Asked

SEALED proposals will be received by the District Engineer, Mississippi River Dredging District, Box 1017, Memphis, Tenn., until 9.30 a. m., January 3, 1928, for furnishing 80 steel pontoons 21 feet 2½ inches by 7 feet by 3 feet, and 40 lengths of steel pontoon 18-inch inside diameter by 40 feet long.

Bids will also be received at the same time for the construction of one 18-inch and one 20-inch suction dredging pumps. Further information may be obtained on application.

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Ship Construction and Repair Bids

Bids Opened in Honolulu for Diesel Tug Boat

BIDS were recently opened at the office of Young Brothers, Honolulu, for the construction of a 125-foot Diesel tug boat. It is understood that the tug boat will be equipped with a 350-horsepower Fairbanks-Morse Diesel engine.

Robins Receives Contract for Repairs on the City of Dalhart

THE Robins Drydock and Repair Company, Brooklyn, New York, has received the contract for repairs to the Shipping Board steamship *City of Dalhart*, at a price of $4,490, bids for which were recently received. Three other proposals were submitted as follows:

Name	Price
Morse Drydock and Repair Company	$5,274
W. and A. Fletcher Company	5,700
Staten Island Shipbuilding Company	7,095

Tietjen and Lang Yard Awarded Repair Contract on S.S. Delaware

BIDS were opened recently at the office of Captain William Park of the Clyde Steamship Company, Pier 36, North River, New York, covering repairs on the steamship *Delaware* caused by the collision of this vessel on November 22 with a Standard Oil barge. Plans and specifications for the work were prepared by Frank S. Martin and Son, naval architects, 25 Broadway, New York. The Tietjen and Lang Drydock Company, Hoboken, N. J., submitted a low bid of $12,461 and a time of 12 continuous running days and received the contract for the work. Other bids submitted include:

Name	Price	Days
W. & A. Fletcher Company	$12,870	14
Morse Drydock and Repair Company	12,946	14
Robins Drydock and Repair Company	15,260	13

S.S. George G. Henry to Be Repaired at New York Harbor Drydock Company Yard

A CONTRACT for repairs to the Pan-American Petroleum and Transportation steamship *George G. Henry* has been awarded to the New York Harbor Drydock Company, Inc., New York. Tenders for the work were received at New York recently, with the following results:

FOR DAMAGE REPAIRS

Name	Price	C.R.D.
New York Harbor Drydock Company, Inc.	$20,615	15
Robins Drydock and Repair Company	25,000	17
Morse Drydock and Repair Company	26,200	25
W. and A. Fletcher Company	28,185	30
Staten Island Shipbuilding Company	36,415	18

FOR OWNERS' VOYAGE REPAIRS

Name	Price
New York Harbor Drydock Company, Inc.	$3,994
Robins Drydock and Repair Company	2,810
Morse Drydock and Repair Company	4,343
W. and A. Fletcher Company	4,560
Staten Island Shipbuilding Company	.....

Motor Bids Received

TENDERS were recently received and opened by Major John C. Gotwals, Corps of Engineers, Room 428 Customhouse, St. Louis, Mo., for the construction of a 940-horsepower, 250-volt direct-connected motor, with the following results:

Name	Amount
Allis-Chalmers Manufacturing Company	$12,485
Westinghouse Electric and Manufacturing Company	13,590
Alternate	13,315
General Electric Company	14,500
Elliott Company	15,437
Starret Equipment Corporation	16,192

The award has not as yet been made.

Steam Lighter Atlantic Repair Bids

A CONTRACT for repairs to the H. P. Cavarly steam lighter *Atlantic* has been awarded to the Theodore A. Crane's Sons Company, New York, at a price of $9,137 and a time of 21 days. Bids for the work were recently received at New York and other tenders included:

Name	Price	Days
Morse Drydock and Repair Company	$9,378	25
Staten Island Shipbuilding Company	9,460	20
W. and A. Fletcher Company	9,600	23
Costagliola, M.	9,867	22
Union Dry Dock and Repair Company	10,360	21
Ira S. Bushey and Sons, Inc.	11,310	22
Tietjen and Lang Drydock Company	11,700	20

S.S. Radnor Repairs Awarded to Robins Yard

THE United States Shipping Board, 45 Broadway, New York, recently awarded a contract to the Robins Drydock and Repair Company, Brooklyn, New York, covering repairs to the steamship *Radnor*, at a price of $4,172. Two other tenders were received, one from the Morse Drydock and Repair Company, Brooklyn, New York, who submitted a price of $4,375, and one from the W. and A. Fletcher Company, Hoboken, N. J., at a price of $5,800.

For additional repairs to the steamship *Radnor*, a contract was awarded to the Staten Island Shipbuilding Company, Staten Island, New York, at a price of $10,948. In this case, three other proposals were received as follows:

Name	Price
W. and A. Fletcher Company	$11,700
Todd Shipyards Corporation	11,720
Morse Drydock and Repair Company	no bid

S.S. West Kedron Repairs Awarded to Robins Yard

THE United States Shipping Board has awarded a contract to the Robins Drydock and Repair Company, Brooklyn, New York, covering repairs to the steamship *West Kedron*, at a price of $7,475. One other tender was received from the Morse Drydock and Repair Company, Brooklyn, New York, who submitted a figure of $8,936.

Bids Opened for Repairs to Shipping Board Steamships Natirar and Otho

TENDERS were recently received and opened at the New York office of the United States Shipping Board, covering repairs to the steamships *Natirar* and *Otho*. The bids received for the *Natirar* were as follows:

Name	Price
New York Harbor Drydock Company	$10,982
W. and A. Fletcher Company	11,400
Morse Drydock and Repair Company	12,530
James Shewan and Sons, Inc.	12,581
Todd Shipyards Corporation	12,659
Federal Shipbuilding Company	13,878
Staten Island Shipbuilding Company	15,455

For repairs to the steamship *Otho*, bids were received from:

Name	Price
Morse Drydock and Repair Company	$8,578
Staten Island Shipbuilding Company	9,150
Robins Drydock and Repair Company	12,900

The awards have not as yet been made.

S.S. Pennsylvania to Be Repaired at Robins Yard

THE Robins Drydock and Repair Company, Erie Basin, Brooklyn, New York, has been awarded the contract for repairs to the steamship *Pennsylvania* of the Texas Company, 17 Battery place, New York. Tenders for the work were recently received, with the following results:

Name	Price	Days
Robins Drydock and Repair Company	$10,755	10
New York Harbor Drydock Company, Inc.	13,490	14
W. & A. Fletcher Company	13,620	12
Morse Drydock and Repair Company	15,274	12
Staten Island Shipbuilding Company	15,934	12

Repair Contract on S.S. Sagaporack Awarded to W. and A. Fletcher Co.

THE United States Shipping Board has awarded a contract to the W. and A. Fletcher Company, Hoboken, New Jersey, covering repairs to the steamship *Sagaporack*, bids for which were recently opened in New York. In this case, two sets of tenders were received for work which is to be done at different times. The bids received were:

Name	Work Preferred First	Later Work
W. & A. Fletcher Company	$11,615	$12,393
James Shewan & Sons, Inc.	13,932	.....
New York Harbor Drydock Company, Inc.	13,960	14,460
Theodore Crane's Sons Company	14,033	15,533
Morse Drydock and Repair Company	14,138	14,638
Robins Drydock and Repair Company	18,215	19,200

Bethlehem Corp. to Repair Tanker Mary Luckenbach at Baltimore Plant

A CONTRACT for extensive repairs as a result of storm damages to the tanker *Mary Luckenbach* of the Luckenbach Steamship Company, Inc., 44 Whitehall street, New York, was recently awarded to the Baltimore plant of the Bethlehem Shipbuilding Corporation, Ltd. The price involved was not given out.

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Oil Tanker Launched on the Great Lakes

THE 400-foot oil tanker *Robert W. Stewart*, which is under construction in the Lorain yards of the American Ship Building Company, was launched on December 3. She will cost $1,000,000. Her length is 400 feet, beam 52 feet and depth 25 feet. Her capacity will be 40,000 barrels of oil. She will be used for the carrying of oil products on the Great Lakes for her owners, the Standard Oil Company of Indiana.

New Graving Dock Built in Puget Sound

A NEW concrete dry dock 171 feet long by 54 feet wide has just been completed by the Skansie Shipbuilding & Dry Dock Company of Gig Harbor, Washington. The dock has 14 feet of water over the sill at high tide.

This dock is one of the few graving docks on the Pacific Coast, the only one on Puget Sound outside of the Navy Yard at Bremerton. It is built of concrete with a wood caisson and is equipped with a 10-inch centrifugal pump driven by a 30 horsepower electric motor which will empty the dock in a little over 3 hours, depending on the tide.

The caisson has sawed wooden frames 8 inches by 10 inches, 16-inch centers with 2-inch planking. It carries 18 tons of ballast and is equipped with a 3-inch pump for flooding. It is 8 feet 4 inches beam amidships and tapers to a 10-inch by 10-inch keel and is 4 feet 4 inches wide at the center of the deck.

Gig Harbor is the center of the fishing industry. About 40 boats make their headquarters here. Besides these boats the dock will be used for the ferries of the Washington Navigation Company in which Mitchell Skansie, owner of the plant, has extensive interests. The plant has already built 11 boats this year including a 70-car ferry 165 feet long, and has contracts for a 70-foot fish boat and an 80-foot cannery tender.

First Electrically Propelled Packet Boat

ANOTHER field for electric ship propulsion will be opened with the completion of an electrically propelled packet boat now being built for the Middlesex Transportation Company of New Brunswick, N. J. This boat, designed by Eads Johnson, naval architect, New York, will have a capacity of 250 tons of package freight and will operate at a speed of 12 miles per hour. It will run between New Brunswick and New York City and will supplement an extensive trucking business carried on by the owners. A large part of the freight carried will consist of Johnson and Johnson products.

The boat will be completely electrified, being the first application of electric drive to packet service. Electric equipment will be supplied by General Electric. The power plant will consist of two Winton Diesel engines, rated 250 horsepower each and running at a speed of 375 revolutions per minute. Each engine will drive a 165-kilowatt, 250-volt, direct current generator.

Staten Island Shipbuilding Company to Manufacture Heat Transfer Equipment

THE Staten Island Shipbuilding Company, Mariners Harbor, Staten Island, N. Y., has formed a division for the manufacture of heat transfer apparatus. The line consists of water storage heaters, feed water heaters, bleeder heaters, waste heat extractors, preheaters, condensers, evaporators, time coolers, oil heaters, oil coolers, humidifiers, de-humidifiers, superheaters, de-superheaters, boilers, tanks, piping (including bends of all materials), pumps, fabricated plate ware and galvanized products.

The plant is exceptionally complete with well organized and maintained shops to produce either plate work, castings, machine work, boiler work, forge work or welded products. William J. Davidson, president of the Staten Island Shipbuilding Company, and also president of the Staten Island National Bank and Trust Company, is chairman of the board of Heat Transfer Products, Inc. George T. Jacocks, of Hartford, Conn. is president and general manager. Sylvan J. Crooker, for many years with the United States Bureau of Standards and the Bureau of Mines, and also formerly chief engineer of the Whitlock Coil Pipe Company, is vice-president in charge of engineering. Walter S. Ogilvy formerly superintendent of the Beach Division of the Whitlock Coil Pipe Company, is vice-president in charge of manufacture, and secretary of the company. George H. Bates, treasurer and general manager of the Staten Island Shipbuilding Company, is treasurer.

Shipping Board Authorizes Extensive Expenditures on the S.S. Leviathan and Other Board Ships

THE United States Shipping Board recently approved a program for the steamship *Leviathan's* regular winter overhauling, which usually takes place at the Boston Navy Yard the last week in December. The amount appropriated for this work was $180,440, which is in addition to $108,000 previously appropriated.

The work to be done includes renewal of boilers and boiler tubes and general engine room maintenance work; hull maintenance and general overhauling of the deck and steward's department. The ship left New York on December 22, and was due to return January 1.

The board authorized an estimated expenditure of not to exceed $75,000 for purchase of new equipment and reconditioning of staterooms, bulkheads, deck and lighting systems in the tourist third class and third class accommodations on the steamship *America*.

Expenditures totalling $60,009 on the steamship *West Cajoot*, operated in the American Australia Orient Line in regular service between Pacific Coast ports and Australia and New Zealand, were also authorized by the board. The steamer is now at Los Angeles and her schedule requires her to meet a sailing at San Francisco on January 18, 1928.

Ferryboat City of Steilacoom in the new Skansie dry dock

Ellis Channel System of Hull Construction in Wide Use

THE Ellis channel system of steel hull construction, introduced in New York in 1925 by Edgar Ames, veteran shipbuilder and organizer, has made rapid progress. Forty-five hulls for varied types of service have been built or are under order.

The Manitowoc Shipbuilding Company, Manitowoc, Wis., is building two Ellis channel steel barges for the United States Government. The average price quoted for plate construction was $23,710 and for channel construction $21,936.

The New York Central was the first important owner to use the system. Its first order was 10 barges. These have been in use over two years in New York Harbor service. They have been followed by a second and third order, the last being a pile driver barge. A number of pile driver barges have also been built for E. E. Gillen Company and the Raymond Concrete Pile Company.

Preliminary plans for dredges, derrick barges, oil barges, sand and gravel barges and lighters are being made for various interests.

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TRADE PUBLICATIONS

CENTRIFUGAL AIR COMPRESSORS.—Small multi-stage centrifugal air compressors are described in a bulletin issued by the General Electric Company, Schenectady, New York.

MARINE GOVERNING DEVICE.—A device known as the participating marine governor for the purpose of preventing the racing of propellers in heavy seas by the control of reciprocating marine engines, is described in a folder issued by the Participating Marine Governor Company of Oakland, Cal. This device is an invention of W. C. Dennis of Oakland, Cal.

OXYGEN JET CUTTING MACHINE.—A tool designed for the efficient, accurate and speedy cutting and shaping of steel, mild steel, chrome nickel steel, manganese steel, cast steel and wrought iron, has been developed by the Hubar-Jones Corporation, New York. A complete description and use of this device is contained in a catalogue now being issued by this company.

MARINE LUBRICANTS.—Special marine lubricants for auxiliary equipment on ships is the subject of a pamphlet issued by the Vacuum Oil Company, New York. This pamphlet contains a brief description of each type of lubricant for use in such installations as ice machines, gyro-compasses, dynamos, telemotor steering gear, spring tunnel bearings, engine and pump bearings, winches and the like.

MACHINING ALLOY STEEL.—This treatise on alloy steels was prepared by Thomas H. Wickenden of the development and research department of the International Nickel Company, New York. The conclusions reached in this bulletin are that under properly controlled shop practice nickel steels will machine more readily than carbon or other alloy steels of the same tensile strength.

BURMEISTER AND WAIN DIESEL ENGINES AND MOTORSHIPS.—Burmeister and Wain, Ltd., Copenhagen, Denmark, has issued two catalogues, one under the title of "Some facts about the Burmeister and Wain Diesel Engines and Motorships" and the second devoted to "A Complete Description of the Diesel Ferry Korsor," which is the largest combined passenger, train and motor car ferry in the world.

TURBINE GENERATOR UNITS.—The Westinghouse Electric and Manufacturing Company, South Philadelphia works, has recently released a bulletin entitled "Direct Connected Turbine Generator Units With Capacity of 5, 7½, 10 and 15 Kilowatts." These units are designed for 125 and 250 volt current operation. A number of illustrations are given showing the construction and operation of these turbine units.

CENTRIFUGAL PUMPS. — Centrifugal pumps and their types, designs and uses, form the subject of an illustrated book distributed by the De Laval Steam Turbine Company, Trenton, N. J. The centrifugal pump, in the past 25 years, has reached a high degree of refinement. Separate chapters of the present work take up the requirements of pumps for general water service, power plant service, water works service, sewage and irrigation pumping, supplying high pressure water to elevators and hydraulic machinery, marine service, mine pumping, fire protection service, hot water heating and brine circulation service, handling oils and paper pulp, etc. The final chapter treats of pump characteristic curves and gives formulae and constants useful to the pump user.

FEED WATER HEATERS.—Bulletin 119, prepared by the Foster Wheeler Corporation, New York, deals with hot water heating systems of the forced circulation type employing exhaust steam from the power plant as the source of heat. This bulletin contains photographs taken in nationally known plants and will indicate to the power plant engineers exactly how this system applies to the modern heating system.

ELECTRIC DRIVE FOR SHIP PROPULSION. —In its annual review of developments in the electrical field under the title "Engineering Achievements of the Westinghouse Electric and Manufacturing Company for the Year 1927," a section is devoted to marine transportation. In this section a general statement is made of the application of electric drive to both naval and merchant vessels as well as the auxiliary uses of electricity including radio communication, lighting, heating and cooking, and the like. A list of ships for which electrically propelled machinery was ordered during the year includes: Two turbo-electric drive ferryboats for the Key System Transit Company, San Francisco, Cal.; two Diesel-electric ferryboats for the Golden Gate Ferry Company, San Francisco; equipment for a Diesel-electric tanker, which will later be built by the Standard Oil Company of California, and five turbo-electric Coast Guard cutters.

BUSINESS NOTES

Norman F. Kimball has been appointed manager of advertising of the American-LaFrance and Foamite Corporation, a combination of the American-LaFrance Fire Engine Company and Foamite-Childs Corporation, Utica, New York.

The Foster Wheeler Corporation, New York, opened an office on December 1 at 109 Tchoupitoulas Street, New Orleans, La., with H. W. Parsons, formerly assistant marine manager in the company's New York office, in charge. This office will handle the company's business in the Gulf district, up the Mississippi River as far as St. Paul, up the Missouri River as far as Kansas City and up the Ohio River as far as Cincinnati.

Fisher and Maier, naval architects and marine engineers, have opened an office in the Forrest building at 119 South Fourth street, Philadelphia, Pa., for the purpose of designing, surveying and supervising new and repair work in the marine field. Both Mr. Fisher and Mr. Maier have until recently been connected with the William Cramp and Sons Ship and Engine Building Company, Philadelphia, Mr. Fisher as general manager and Mr. Maier as assistant general manager of the Kensington Shipyard, which was the repair department of the Cramp Company. Both members of this firm have had 30 years' experience in all branches of shipbuilding and repair work.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary-Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc., 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club, 4th and River streets, Hoboken, N. J. President—Mason F. Grymes.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters, 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

National Merchant Marine Association. Munsey Bldg., Washington, D. C. President—Hon. J. E. Ransdell.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association, 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aéronautique. Secrétariat Général—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

FEB 15 1928

FEBRUARY, 1928

Marine Engineering and Shipping Age

BUILT
for hard work
Because of their rugged construction, Exide-Ironclad Batteries will stay on duty year in and year out with a minimum of attention. You can depend on them to keep your trucks and tractors moving fast all day, every day, under the hardest conditions.
The Electric Storage Battery Co
Philadelphia, Pa.
Exide Batteries of Canada, Limited, Toronto
Exide
IRONCLAD
BATTERIES

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TRADE PUBLICATIONS

CENTRIFUGAL AIR COMPRESSORS.—Small multi-stage centrifugal air compressors are described in a bulletin issued by the General Electric Company, Schenectady, New York.

MARINE GOVERNING DEVICE.—A device known as the participating marine governor for the purpose of preventing the racing of propellers in heavy seas by the control of reciprocating marine engines, is described in a folder issued by the Participating Marine Governor Company of Oakland, Cal. This device is an invention of W. C. Dennis of Oakland, Cal.

OXYGEN JET CUTTING MACHINE.—A tool designed for the efficient, accurate and speedy cutting and shaping of steel, mild steel, chrome nickel steel, manganese steel, cast steel and wrought iron, has been developed by the Hubar-Jones Corporation, New York. A complete description and use of this device is contained in a catalogue now being issued by this company.

MARINE LUBRICANTS.—Special marine lubricants for auxiliary equipment on ships is the subject of a pamphlet issued by the Vacuum Oil Company, New York. This pamphlet contains a brief description of each type of lubricant for use in such installations as ice machines, gyro-compasses, dynamos, telemotor steering gear, spring tunnel bearings, engine and pump bearings, winches and the like.

MACHINING ALLOY STEEL.—This treatise on alloy steels was prepared by Thomas H. Wickenden of the development and research department of the International Nickel Company, New York. The conclusions reached in this bulletin are that under properly controlled shop practice nickel steels will machine more readily than carbon or other alloy steels of the same tensile strength.

BURMEISTER AND WAIN DIESEL ENGINES AND MOTORSHIPS.—Burmeister and Wain, Ltd., Copenhagen, Denmark, has issued two catalogues, one under the title of "Some facts about the Burmeister and Wain Diesel Engines and Motorships" and the second devoted to "A Complete Description of the Diesel Ferry Korsor," which is the largest combined passenger, train and motor car ferry in the world.

TURBINE GENERATOR UNITS.—The Westinghouse Electric and Manufacturing Company, South Philadelphia works, has recently released a bulletin entitled "Direct Connected Turbine Generator Units With Capacity of 5, 7½, 10 and 15 Kilowatts." These units are designed for 125 and 250 volt current operation. A number of illustrations are given showing the construction and operation of these turbine units.

CENTRIFUGAL PUMPS. — Centrifugal pumps and their types, designs and uses, form the subject of an illustrated book distributed by the De Laval Steam Turbine Company, Trenton, N. J. The centrifugal pump, in the past 25 years, has reached a high degree of refinement. Separate chapters of the present work take up the requirements of pumps for general water service, power plant service, water works service, sewage and irrigation pumping, supplying high pressure water to elevators and hydraulic machinery, marine service, mine pumping, fire protection service, hot water heating and brine circulation service, handling oils and paper pulp, etc. The final chapter treats of pump characteristic curves and gives formulae and constants useful to the pump user.

FEED WATER HEATERS.—Bulletin 119, prepared by the Foster Wheeler Corporation, New York, deals with hot water heating systems of the forced circulation type employing exhaust steam from the power plant as the source of heat. This bulletin contains photographs taken in nationally known plants and will indicate to the power plant engineers exactly how this system applies to the modern heating system.

ELECTRIC DRIVE FOR SHIP PROPULSION. —In its annual review of developments in the electrical field under the title "Engineering Achievements of the Westinghouse Electric and Manufacturing Company for the Year 1927," a section is devoted to marine transportation. In this section a general statement is made of the application of electric drive to both naval and merchant vessels as well as the auxiliary uses of electricity including radio communication, lighting, heating and cooking, and the like. A list of ships for which electrically propelled machinery was ordered during the year includes: Two turbo-electric drive ferryboats for the Key System Transit Company, San Francisco, Cal.; two Diesel-electric ferryboats for the Golden Gate Ferry Company, San Francisco; equipment for a Diesel-electric tanker, which will later be built by the Standard Oil Company of California, and five turbo-electric Coast Guard cutters.

BUSINESS NOTES

Norman F. Kimball has been appointed manager of advertising of the American-LaFrance and Foamite Corporation, a combination of the American-LaFrance Fire Engine Company and Foamite-Childs Corporation, Utica, New York.

The Foster Wheeler Corporation, New York, opened an office on December 1 at 109 Tchoupitoulas Street, New Orleans, La., with H. W. Parsons, formerly assistant marine manager in the company's New York office, in charge. This office will handle the company's business in the Gulf district, up the Mississippi River as far as St. Paul, up the Missouri River as far as Kansas City and up the Ohio River as far as Cincinnati.

Fisher and Maier, naval architects and marine engineers, have opened an office in the Forrest building at 119 South Fourth street, Philadelphia, Pa., for the purpose of designing, surveying and supervising new and repair work in the marine field. Both Mr. Fisher and Mr. Maier have until recently been connected with the William Cramp and Sons Ship and Engine Building Company, Philadelphia, Mr. Fisher as general manager and Mr. Maier as assistant general manager of the Kensington Shipyard, which was the repair department of the Cramp Company. Both members of this firm have had 30 years' experience in all branches of shipbuilding and repair work.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary-Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc., 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club, 4th and River streets, Hoboken, N. J. President—Mason F. Grymes.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tennis-wood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters, 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

National Merchant Marine Association. Munsey Bldg., Washington, D. C. President—Hon. J. E. Ransdell.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association, 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aéronautique. Secrétariat Général—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

Generated on 2024-09-12 14:57 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

FEB 15 1928

FEBRUARY, 1928

Marine Engineering and Shipping Age

BUILT
for hard work
Because of their rugged construction, Exide-Ironclad Batteries will stay on duty year in and year out with a minimum of attention. You can depend on them to keep your trucks and tractors moving fast all day, every day, under the hardest conditions.
The Electric Storage Battery Co
Philadelphia, Pa.
Exide Batteries of Canada, Limited, Toronto
Exide
IRONCLAD
BATTERIES

Generated on 2024-09-12 14:19 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TRADE PUBLICATIONS

CENTRIFUGAL AIR COMPRESSORS.—Small multi-stage centrifugal air compressors are described in a bulletin issued by the General Electric Company, Schenectady, New York.

MARINE GOVERNING DEVICE.—A device known as the participating marine governor for the purpose of preventing the racing of propellers in heavy seas by the control of reciprocating marine engines, is described in a folder issued by the Participating Marine Governor Company of Oakland, Cal. This device is an invention of W. C. Dennis of Oakland, Cal.

OXYGEN JET CUTTING MACHINE.—A tool designed for the efficient, accurate and speedy cutting and shaping of steel, mild steel, chrome nickel steel, manganese steel, cast steel and wrought iron, has been developed by the Hubar-Jones Corporation, New York. A complete description and use of this device is contained in a catalogue now being issued by this company.

MARINE LUBRICANTS.—Special marine lubricants for auxiliary equipment on ships is the subject of a pamphlet issued by the Vacuum Oil Company, New York. This pamphlet contains a brief description of each type of lubricant for use in such installations as ice machines, gyro-compasses, dynamos, telemotor steering gear, spring tunnel bearings, engine and pump bearings, winches and the like.

MACHINING ALLOY STEEL.—This treatise on alloy steels was prepared by Thomas H. Wickenden of the development and research department of the International Nickel Company, New York. The conclusions reached in this bulletin are that under properly controlled shop practice nickel steels will machine more readily than carbon or other alloy steels of the same tensile strength.

BURMEISTER AND WAIN DIESEL ENGINES AND MOTORSHIPS.—Burmeister and Wain, Ltd., Copenhagen, Denmark, has issued two catalogues, one under the title of "Some facts about the Burmeister and Wain Diesel Engines and Motorships" and the second devoted to "A Complete Description of the Diesel Ferry Korsor," which is the largest combined passenger, train and motor car ferry in the world.

TURBINE GENERATOR UNITS.—The Westinghouse Electric and Manufacturing Company, South Philadelphia works, has recently released a bulletin entitled "Direct Connected Turbine Generator Units With Capacity of 5, 7½, 10 and 15 Kilowatts." These units are designed for 125 and 250 volt current operation. A number of illustrations are given showing the construction and operation of these turbine units.

CENTRIFUGAL PUMPS. — Centrifugal pumps and their types, designs and uses, form the subject of an illustrated book distributed by the De Laval Steam Turbine Company, Trenton, N. J. The centrifugal pump, in the past 25 years, has reached a high degree of refinement. Separate chapters of the present work take up the requirements of pumps for general water service, power plant service, water works service, sewage and irrigation pumping, supplying high pressure water to elevators and hydraulic machinery, marine service, mine pumping, fire protection service, hot water heating and brine circulation service, handling oils and paper pulp, etc. The final chapter treats of pump characteristic curves and gives formulae and constants useful to the pump user.

FEED WATER HEATERS.—Bulletin 119, prepared by the Foster Wheeler Corporation, New York, deals with hot water heating systems of the forced circulation type employing exhaust steam from the power plant as the source of heat. This bulletin contains photographs taken in nationally known plants and will indicate to the power plant engineers exactly how this system applies to the modern heating system.

ELECTRIC DRIVE FOR SHIP PROPULSION. —In its annual review of developments in the electrical field under the title "Engineering Achievements of the Westinghouse Electric and Manufacturing Company for the Year 1927," a section is devoted to marine transportation. In this section a general statement is made of the application of electric drive to both naval and merchant vessels as well as the auxiliary uses of electricity including radio communication, lighting, heating and cooking, and the like. A list of ships for which electrically propelled machinery was ordered during the year includes: Two turbo-electric drive ferryboats for the Key System Transit Company, San Francisco, Cal.; two Diesel-electric ferryboats for the Golden Gate Ferry Company, San Francisco; equipment for a Diesel-electric tanker, which will later be built by the Standard Oil Company of California, and five turbo-electric Coast Guard cutters.

BUSINESS NOTES

Norman F. Kimball has been appointed manager of advertising of the American-LaFrance and Foamite Corporation, a combination of the American-LaFrance Fire Engine Company and Foamite-Childs Corporation, Utica, New York.

The Foster Wheeler Corporation, New York, opened an office on December 1 at 109 Tchoupitoulas Street, New Orleans, La., with H. W. Parsons, formerly assistant marine manager in the company's New York office, in charge. This office will handle the company's business in the Gulf district, up the Mississippi River as far as St. Paul, up the Missouri River as far as Kansas City and up the Ohio River as far as Cincinnati.

Fisher and Maier, naval architects and marine engineers, have opened an office in the Forrest building at 119 South Fourth street, Philadelphia, Pa., for the purpose of designing, surveying and supervising new and repair work in the marine field. Both Mr. Fisher and Mr. Maier have until recently been connected with the William Cramp and Sons Ship and Engine Building Company, Philadelphia, Mr. Fisher as general manager and Mr. Maier as assistant general manager of the Kensington Shipyard, which was the repair department of the Cramp Company. Both members of this firm have had 30 years' experience in all branches of shipbuilding and repair work.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary-Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc., 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club, 4th and River streets, Hoboken, N. J. President—Mason F. Grymes.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tennis-wood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters, 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

National Merchant Marine Association. Munsey Bldg., Washington, D. C. President—Hon. J. E. Ransdell.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association, 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aéronautique. Secrétariat Général—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

Generated on 2024-09-12 14:20 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

FEB 15 1928

FEBRUARY, 1928

Marine Engineering and Shipping Age

BUILT
for hard work
Because of their rugged construction, Exide-Ironclad Batteries will stay on duty year in and year out with a minimum of attention. You can depend on them to keep your trucks and tractors moving fast all day, every day, under the hardest conditions.
The Electric Storage Battery Co
Philadelphia, Pa.
Exide Batteries of Canada, Limited, Toronto
Exide
IRONCLAD
BATTERIES

Generated on 2024-09-12 14:16 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TRADE PUBLICATIONS

CENTRIFUGAL AIR COMPRESSORS.—Small multi-stage centrifugal air compressors are described in a bulletin issued by the General Electric Company, Schenectady, New York.

MARINE GOVERNING DEVICE.—A device known as the participating marine governor for the purpose of preventing the racing of propellers in heavy seas by the control of reciprocating marine engines, is described in a folder issued by the Participating Marine Governor Company of Oakland, Cal. This device is an invention of W. C. Dennis of Oakland, Cal.

OXYGEN JET CUTTING MACHINE.—A tool designed for the efficient, accurate and speedy cutting and shaping of steel, mild steel, chrome nickel steel, manganese steel, cast steel and wrought iron, has been developed by the Hubar-Jones Corporation, New York. A complete description and use of this device is contained in a catalogue now being issued by this company.

MARINE LUBRICANTS.—Special marine lubricants for auxiliary equipment on ships is the subject of a pamphlet issued by the Vacuum Oil Company, New York. This pamphlet contains a brief description of each type of lubricant for use in such installations as ice machines, gyro-compasses, dynamos, telemotor steering gear, spring tunnel bearings, engine and pump bearings, winches and the like.

MACHINING ALLOY STEEL.—This treatise on alloy steels was prepared by Thomas H. Wickenden of the development and research department of the International Nickel Company, New York. The conclusions reached in this bulletin are that under properly controlled shop practice nickel steels will machine more readily than carbon or other alloy steels of the same tensile strength.

BURMEISTER AND WAIN DIESEL ENGINES AND MOTORSHIPS.—Burmeister and Wain, Ltd., Copenhagen, Denmark, has issued two catalogues, one under the title of "Some facts about the Burmeister and Wain Diesel Engines and Motorships" and the second devoted to "A Complete Description of the Diesel Ferry Korsor," which is the largest combined passenger, train and motor car ferry in the world.

TURBINE GENERATOR UNITS.—The Westinghouse Electric and Manufacturing Company, South Philadelphia works, has recently released a bulletin entitled "Direct Connected Turbine Generator Units With Capacity of 5, 7½, 10 and 15 Kilowatts." These units are designed for 125 and 250 volt current operation. A number of illustrations are given showing the construction and operation of these turbine units.

CENTRIFUGAL PUMPS. — Centrifugal pumps and their types, designs and uses, form the subject of an illustrated book distributed by the De Laval Steam Turbine Company, Trenton, N. J. The centrifugal pump, in the past 25 years, has reached a high degree of refinement. Separate chapters of the present work take up the requirements of pumps for general water service, power plant service, water works service, sewage and irrigation pumping, supplying high pressure water to elevators and hydraulic machinery, marine service, mine pumping, fire protection service, hot water heating and brine circulation service, handling oils and paper pulp, etc. The final chapter treats of pump characteristic curves and gives formulae and constants useful to the pump user.

FEED WATER HEATERS.—Bulletin 119, prepared by the Foster Wheeler Corporation, New York, deals with hot water heating systems of the forced circulation type employing exhaust steam from the power plant as the source of heat. This bulletin contains photographs taken in nationally known plants and will indicate to the power plant engineers exactly how this system applies to the modern heating system.

ELECTRIC DRIVE FOR SHIP PROPULSION. —In its annual review of developments in the electrical field under the title "Engineering Achievements of the Westinghouse Electric and Manufacturing Company for the Year 1927," a section is devoted to marine transportation. In this section a general statement is made of the application of electric drive to both naval and merchant vessels as well as the auxiliary uses of electricity including radio communication, lighting, heating and cooking, and the like. A list of ships for which electrically propelled machinery was ordered during the year includes: Two turbo-electric drive ferryboats for the Key System Transit Company, San Francisco, Cal.; two Diesel-electric ferryboats for the Golden Gate Ferry Company, San Francisco; equipment for a Diesel-electric tanker, which will later be built by the Standard Oil Company of California, and five turbo-electric Coast Guard cutters.

BUSINESS NOTES

Norman F. Kimball has been appointed manager of advertising of the American-LaFrance and Foamite Corporation, a combination of the American-LaFrance Fire Engine Company and Foamite-Childs Corporation, Utica, New York.

The Foster Wheeler Corporation, New York, opened an office on December 1 at 109 Tchoupitoulas Street, New Orleans, La., with H. W. Parsons, formerly assistant marine manager in the company's New York office, in charge. This office will handle the company's business in the Gulf district, up the Mississippi River as far as St. Paul, up the Missouri River as far as Kansas City and up the Ohio River as far as Cincinnati.

Fisher and Maier, naval architects and marine engineers, have opened an office in the Forrest building at 119 South Fourth street, Philadelphia, Pa., for the purpose of designing, surveying and supervising new and repair work in the marine field. Both Mr. Fisher and Mr. Maier have until recently been connected with the William Cramp and Sons Ship and Engine Building Company, Philadelphia, Mr. Fisher as general manager and Mr. Maier as assistant general manager of the Kensington Shipyard, which was the repair department of the Cramp Company. Both members of this firm have had 30 years' experience in all branches of shipbuilding and repair work.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary-Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc., 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club, 4th and River streets, Hoboken, N. J. President—Mason F. Grymes.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tennis-wood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters, 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

National Merchant Marine Association. Munsey Bldg., Washington, D. C. President—Hon. J. E. Ransdell.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association, 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aéronautique. Secrétariat Général—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

Generated on 2024-09-12 14:36 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

FEB 15 1928

FEBRUARY, 1928

Marine Engineering and Shipping Age

BUILT
for hard work
Because of their rugged construction, Exide-Ironclad Batteries will stay on duty year in and year out with a minimum of attention. You can depend on them to keep your trucks and tractors moving fast all day, every day, under the hardest conditions.
The Electric Storage Battery Co
Philadelphia, Pa.
Exide Batteries of Canada, Limited, Toronto
Exide
IRONCLAD
BATTERIES

Generated on 2024-09-12 14:14 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TRADE PUBLICATIONS

CENTRIFUGAL AIR COMPRESSORS.—Small multi-stage centrifugal air compressors are described in a bulletin issued by the General Electric Company, Schenectady, New York.

MARINE GOVERNING DEVICE.—A device known as the participating marine governor for the purpose of preventing the racing of propellers in heavy seas by the control of reciprocating marine engines, is described in a folder issued by the Participating Marine Governor Company of Oakland, Cal. This device is an invention of W. C. Dennis of Oakland, Cal.

OXYGEN JET CUTTING MACHINE.—A tool designed for the efficient, accurate and speedy cutting and shaping of steel, mild steel, chrome nickel steel, manganese steel, cast steel and wrought iron, has been developed by the Hubar-Jones Corporation, New York. A complete description and use of this device is contained in a catalogue now being issued by this company.

MARINE LUBRICANTS.—Special marine lubricants for auxiliary equipment on ships is the subject of a pamphlet issued by the Vacuum Oil Company, New York. This pamphlet contains a brief description of each type of lubricant for use in such installations as ice machines, gyro-compasses, dynamos, telemotor steering gear, spring tunnel bearings, engine and pump bearings, winches and the like.

MACHINING ALLOY STEEL.—This treatise on alloy steels was prepared by Thomas H. Wickenden of the development and research department of the International Nickel Company, New York. The conclusions reached in this bulletin are that under properly controlled shop practice nickel steels will machine more readily than carbon or other alloy steels of the same tensile strength.

BURMEISTER AND WAIN DIESEL ENGINES AND MOTORSHIPS.—Burmeister and Wain, Ltd., Copenhagen, Denmark, has issued two catalogues, one under the title of "Some facts about the Burmeister and Wain Diesel Engines and Motorships" and the second devoted to "A Complete Description of the Diesel Ferry Korsor," which is the largest combined passenger, train and motor car ferry in the world.

TURBINE GENERATOR UNITS.—The Westinghouse Electric and Manufacturing Company, South Philadelphia works, has recently released a bulletin entitled "Direct Connected Turbine Generator Units With Capacity of 5, 7½, 10 and 15 Kilowatts." These units are designed for 125 and 250 volt current operation. A number of illustrations are given showing the construction and operation of these turbine units.

CENTRIFUGAL PUMPS. — Centrifugal pumps and their types, designs and uses, form the subject of an illustrated book distributed by the De Laval Steam Turbine Company, Trenton, N. J. The centrifugal pump, in the past 25 years, has reached a high degree of refinement. Separate chapters of the present work take up the requirements of pumps for general water service, power plant service, water works service, sewage and irrigation pumping, supplying high pressure water to elevators and hydraulic machinery, marine service, mine pumping, fire protection service, hot water heating and brine circulation service, handling oils and paper pulp, etc. The final chapter treats of pump characteristic curves and gives formulae and constants useful to the pump user.

FEED WATER HEATERS.—Bulletin 119, prepared by the Foster Wheeler Corporation, New York, deals with hot water heating systems of the forced circulation type employing exhaust steam from the power plant as the source of heat. This bulletin contains photographs taken in nationally known plants and will indicate to the power plant engineers exactly how this system applies to the modern heating system.

ELECTRIC DRIVE FOR SHIP PROPULSION. —In its annual review of developments in the electrical field under the title "Engineering Achievements of the Westinghouse Electric and Manufacturing Company for the Year 1927," a section is devoted to marine transportation. In this section a general statement is made of the application of electric drive to both naval and merchant vessels as well as the auxiliary uses of electricity including radio communication, lighting, heating and cooking, and the like. A list of ships for which electrically propelled machinery was ordered during the year includes: Two turbo-electric drive ferryboats for the Key System Transit Company, San Francisco, Cal.; two Diesel-electric ferryboats for the Golden Gate Ferry Company, San Francisco; equipment for a Diesel-electric tanker, which will later be built by the Standard Oil Company of California, and five turbo-electric Coast Guard cutters.

BUSINESS NOTES

Norman F. Kimball has been appointed manager of advertising of the American-LaFrance and Foamite Corporation, a combination of the American-LaFrance Fire Engine Company and Foamite-Childs Corporation, Utica, New York.

The Foster Wheeler Corporation, New York, opened an office on December 1 at 109 Tchoupitoulas Street, New Orleans, La., with H. W. Parsons, formerly assistant marine manager in the company's New York office, in charge. This office will handle the company's business in the Gulf district, up the Mississippi River as far as St. Paul, up the Missouri River as far as Kansas City and up the Ohio River as far as Cincinnati.

Fisher and Maier, naval architects and marine engineers, have opened an office in the Forrest building at 119 South Fourth street, Philadelphia, Pa., for the purpose of designing, surveying and supervising new and repair work in the marine field. Both Mr. Fisher and Mr. Maier have until recently been connected with the William Cramp and Sons Ship and Engine Building Company, Philadelphia, Mr. Fisher as general manager and Mr. Maier as assistant general manager of the Kensington Shipyard, which was the repair department of the Cramp Company. Both members of this firm have had 30 years' experience in all branches of shipbuilding and repair work.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary-Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc., 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club, 4th and River streets, Hoboken, N. J. President—Mason F. Grymes.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tennis-wood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters, 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

National Merchant Marine Association. Munsey Bldg., Washington, D. C. President—Hon. J. E. Ransdell.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association, 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aéronautique. Secrétariat Genéral—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

FEB 15 1928

FEBRUARY, 1928

Marine Engineering and Shipping Age

BUILT
for hard work
Because of their rugged construction, Exide-Ironclad Batteries will stay on duty year in and year out with a minimum of attention. You can depend on them to keep your trucks and tractors moving fast all day, every day, under the hardest conditions.
The Electric Storage Battery Co
Philadelphia, Pa.
Exide Batteries of Canada, Limited, Toronto
Exide
IRONCLAD
BATTERIES

Generated on 2024-09-12 14:49 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

TRADE PUBLICATIONS

CENTRIFUGAL AIR COMPRESSORS.—Small multi-stage centrifugal air compressors are described in a bulletin issued by the General Electric Company, Schenectady, New York.

MARINE GOVERNING DEVICE.—A device known as the participating marine governor for the purpose of preventing the racing of propellers in heavy seas by the control of reciprocating marine engines, is described in a folder issued by the Participating Marine Governor Company of Oakland, Cal. This device is an invention of W. C. Dennis of Oakland, Cal.

OXYGEN JET CUTTING MACHINE.—A tool designed for the efficient, accurate and speedy cutting and shaping of steel, mild steel, chrome nickel steel, manganese steel, cast steel and wrought iron, has been developed by the Hubar-Jones Corporation, New York. A complete description and use of this device is contained in a catalogue now being issued by this company.

MARINE LUBRICANTS.—Special marine lubricants for auxiliary equipment on ships is the subject of a pamphlet issued by the Vacuum Oil Company, New York. This pamphlet contains a brief description of each type of lubricant for use in such installations as ice machines, gyro-compasses, dynamos, telemotor steering gear, spring tunnel bearings, engine and pump bearings, winches and the like.

MACHINING ALLOY STEEL.—This treatise on alloy steels was prepared by Thomas H. Wickenden of the development and research department of the International Nickel Company, New York. The conclusions reached in this bulletin are that under properly controlled shop practice nickel steels will machine more readily than carbon or other alloy steels of the same tensile strength.

BURMEISTER AND WAIN DIESEL ENGINES AND MOTORSHIPS.—Burmeister and Wain, Ltd., Copenhagen, Denmark, has issued two catalogues, one under the title of "Some facts about the Burmeister and Wain Diesel Engines and Motorships" and the second devoted to "A Complete Description of the Diesel Ferry Korsor," which is the largest combined passenger, train and motor car ferry in the world.

TURBINE GENERATOR UNITS.—The Westinghouse Electric and Manufacturing Company, South Philadelphia works, has recently released a bulletin entitled "Direct Connected Turbine Generator Units With Capacity of 5, 7½, 10 and 15 Kilowatts." These units are designed for 125 and 250 volt current operation. A number of illustrations are given showing the construction and operation of these turbine units.

CENTRIFUGAL PUMPS. — Centrifugal pumps and their types, designs and uses, form the subject of an illustrated book distributed by the De Laval Steam Turbine Company, Trenton, N. J. The centrifugal pump, in the past 25 years, has reached a high degree of refinement. Separate chapters of the present work take up the requirements of pumps for general water service, power plant service, water works service, sewage and irrigation pumping, supplying high pressure water to elevators and hydraulic machinery, marine service, mine pumping, fire protection service, hot water heating and brine circulation service, handling oils and paper pulp, etc. The final chapter treats of pump characteristic curves and gives formulae and constants useful to the pump user.

FEED WATER HEATERS.—Bulletin 119, prepared by the Foster Wheeler Corporation, New York, deals with hot water heating systems of the forced circulation type employing exhaust steam from the power plant as the source of heat. This bulletin contains photographs taken in nationally known plants and will indicate to the power plant engineers exactly how this system applies to the modern heating system.

ELECTRIC DRIVE FOR SHIP PROPULSION. —In its annual review of developments in the electrical field under the title "Engineering Achievements of the Westinghouse Electric and Manufacturing Company for the Year 1927," a section is devoted to marine transportation. In this section a general statement is made of the application of electric drive to both naval and merchant vessels as well as the auxiliary uses of electricity including radio communication, lighting, heating and cooking, and the like. A list of ships for which electrically propelled machinery was ordered during the year includes: Two turbo-electric drive ferryboats for the Key System Transit Company, San Francisco, Cal.; two Diesel-electric ferryboats for the Golden Gate Ferry Company, San Francisco; equipment for a Diesel-electric tanker, which will later be built by the Standard Oil Company of California, and five turbo-electric Coast Guard cutters.

BUSINESS NOTES

Norman F. Kimball has been appointed manager of advertising of the American-LaFrance and Foamite Corporation, a combination of the American-LaFrance Fire Engine Company and Foamite-Childs Corporation, Utica, New York.

The Foster Wheeler Corporation, New York, opened an office on December 1 at 109 Tchoupitoulas Street, New Orleans, La., with H. W. Parsons, formerly assistant marine manager in the company's New York office, in charge. This office will handle the company's business in the Gulf district, up the Mississippi River as far as St. Paul, up the Missouri River as far as Kansas City and up the Ohio River as far as Cincinnati.

Fisher and Maier, naval architects and marine engineers, have opened an office in the Forrest building at 119 South Fourth street, Philadelphia, Pa., for the purpose of designing, surveying and supervising new and repair work in the marine field. Both Mr. Fisher and Mr. Maier have until recently been connected with the William Cramp and Sons Ship and Engine Building Company, Philadelphia, Mr. Fisher as general manager and Mr. Maier as assistant general manager of the Kensington Shipyard, which was the repair department of the Cramp Company. Both members of this firm have had 30 years' experience in all branches of shipbuilding and repair work.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary-Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc., 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club, 4th and River streets, Hoboken, N. J. President—Mason F. Grymes.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tennis-wood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters, 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

National Merchant Marine Association. Munsey Bldg., Washington, D. C. President—Hon. J. E. Ransdell.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association, 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aéronautique. Secrétariat Genéral—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

Generated on 2024-09-12 14:15 GMT / https://hdl.handle.net/2027/mdp.39015013713352
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN